

Engineering
Library

AUG 5 1921

In This Issue—*Eliminating Fire Hazards*

MOTOR AGE

Vol. XL
Number 5

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, AUGUST 4, 1921

Thirty-five Cents a Copy
Three Dollars a Year

THERE'S A TOUCH OF TOMORROW IN ALL COLE DOES TODAY



Roadster

Cole Aero-EIGHT



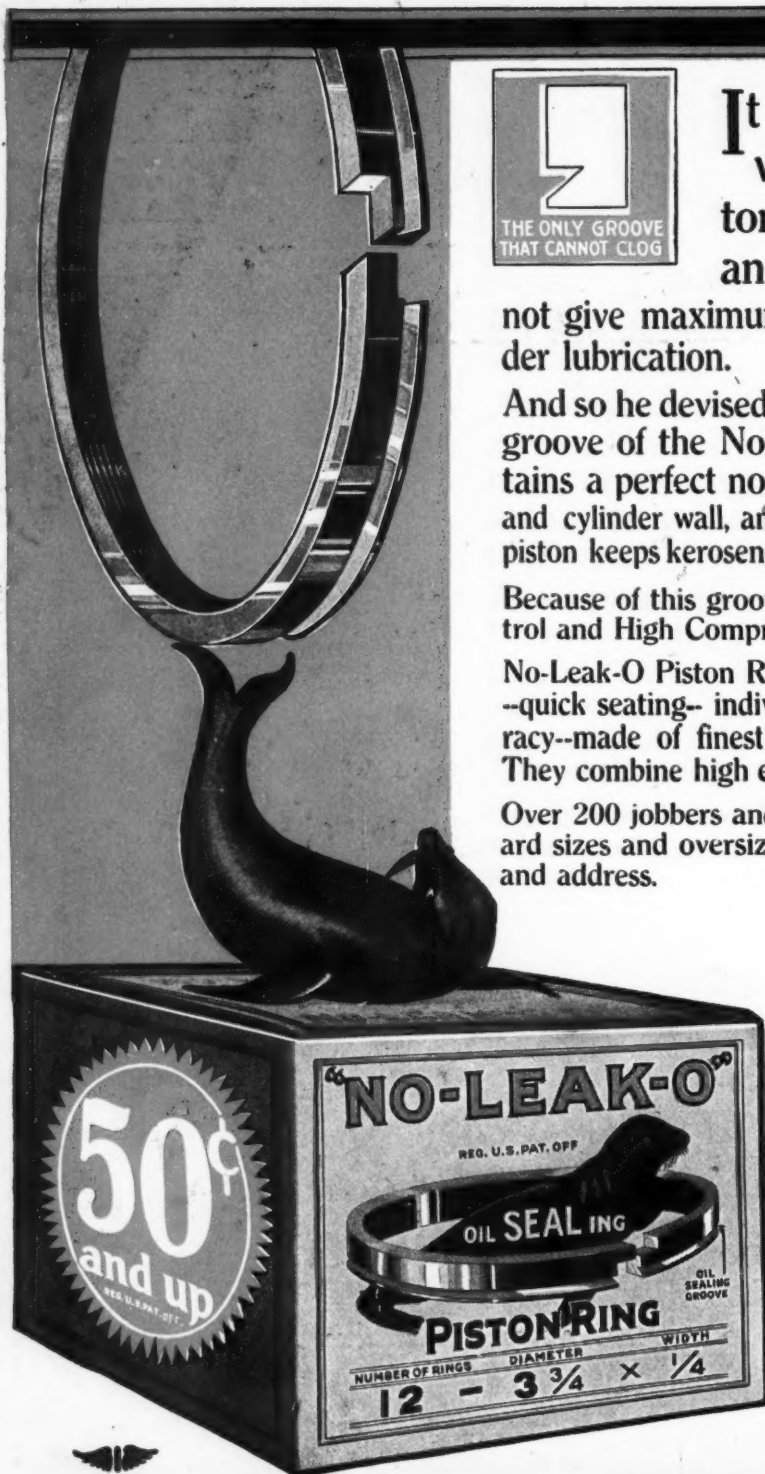
The new *Cole Aero-EIGHT* is not only the *best* Cole ever built, but the most beautiful—beautiful in the things that please the eye and in everything that

serves and soothes the passenger's mind and body. Dealers value the Cole policy of constantly building *better* cars, as their strongest asset.

COLE MOTOR CAR COMPANY, INDIANAPOLIS, U. S. A.
Creators of Advanced Motor Cars

NO-LEAK-O

SOLVES EVERY PISTON RING PROBLEM



It was John E. Norwood, inventor of the No-Leak-O Piston Ring who discovered that an "ordinary" piston ring would

not give maximum compression and perfect cylinder lubrication.

And so he devised the original, "oilSEALing" angled groove of the No-Leak-O Piston Ring which maintains a perfect non-leaking oil seal between piston and cylinder wall, and when reversed in the top groove of each piston keeps kerosene and unvaporized gasoline out of oil pit.

Because of this groove No-Leak-O rings give proper Oil Control and High Compression in *each individual ring*.

No-Leak-O Piston Rings are made in one piece--easy to install--quick seating--individually tested and guaranteed for accuracy--made of finest material--guaranteed against breakage. They combine high efficiency with low cost and lasting results.

Over 200 jobbers and dealers carry No-Leak-O in all standard sizes and oversizes. If yours does not send us his name and address.

Free Literature

Write for free booklet "The Piston Ring Problem and its Solution."--Also price list and special offer to the trade. Let us tell you how to "cash in" on our 1921 Saturday Evening Post Advertising. **WRITE TODAY.**

Important: In buying Piston Rings insist on the genuine No-Leak-O with the original "oilSEALing" groove, packed in this standard package bearing the famous ring and seal, our registered trade mark.

NO-LEAK-O
PISTON RING COMPANY

Baltimore

Maryland



NO-LEAK-O *Piston Rings*
WITH THE ORIGINAL OIL SEALING GROOVE



MOTOR AGE

Published Every Thursday by

THE CLASS JOURNAL COMPANY

MALLERS BUILDING

59 East Madison Street, CHICAGO

HORACE M. SWETLAND, Pres. W. I. RALPH, Vice-Pres.
E. M. COREY, Treas. A. B. SWETLAND, Gen. Mgr.

Member Audit Bureau of Circulations; Member Assoc. Business Papers, Inc.

Vol. XL

August 4, 1921

No. 5

CONTENTS

Who Pays the Bill?	7
Intake Manifolding	10
Learning by Doing Things	12
Racing Engines of the Future	14
The Service Manager Speaks:	15
Sedan Added to H. C. S. Line of Cars	16
Boyce Moto-Meter Light	16
Bosch Equipment for Ford Cars and Fordson Tractors	16
Premo Roadster Is Built on Stock "Magic Six" Chassis	17
Electrical Bench Has Novel Shaft Drive	17
Watson Stabilator	18
Practical Tire Merchandising and Repairing	19
<i>The Service Car and Its Equipment</i>	
News of the Industry	21 to 28

DEPARTMENTS

Automotive Architecture	29
Better Business	30
Law in Your Business	31
The Readers' Clearing House	32
The Accessory Show Case	36
Fan Belt Sizes and Types	38
The Automotive Repair Shop	39
Specifications of Passenger Cars, Trucks and Tractors	40
Coming Motor Events	44

Index to Advertisers Next to Last Page.

MOTOR AGE

MALLERS BUILDING
CHICAGOPhone Randolph 6960
Cable Address "Motage"

E. E. HAIGHT, Manager

DAVID BEECROFT, Directing Editor

RAY W. SHERMAN, Executive Editor B. M. IKERT, Editor

BRANCH OFFICES

DETROIT, 317 Fort St., W., Phone Maine 1351; CLEVELAND, 536-540 Guardian Bldg., Main 6432; NEW YORK CITY, U. P. C. Bldg., 239 W. 39th St., Phone Bryant 8760; PHILADELPHIA, Widener Bldg., Phone Locust 5189; BOSTON, 185 Devonshire St. Phone 4336 Ft. Hill.

SUBSCRIPTION RATES

United States, Mexico and U. S. Possessions	\$ 3.00 per year
Canada	5.00 per year
All Other Countries in Postal Union	6.00 per year
Single Copies	35 cents

Make Checks Payable to Motor Age

Entered as second-class matter, September 19, 1899, at the Post Office, Chicago, Illinois, under Act of March 3, 1879.

Owned by UNITED PUBLISHERS CORPORATION, 239 W. 39th St., New York, H. M. Swetland, Pres.; Charles S. Phillips, Vice-Pres.; A. C. Pearson, Treas.; Fritz J. Frank, Sec.

What do you know about Automotive Electricity?

Make yourself master of the **one most important technical branch** of motor car repair work, and you rise above the lot of the mechanic.

Electrical problems are the most frequent and least understood of all motor car troubles. And the man who is able, **because of expert training**, to solve them intelligently and quickly, will find a bigger and better paying job awaiting him.

The N. Y. E. S. course fits you by **ACTUAL PRACTICE** to handle every kind of repair, replacement and installation job on every make of starting, lighting and ignition system known to the automotive industry. This includes farm lighting and power plants and airplane systems as well.

At the N. Y. E. S. you **LEARN BY DOING**. You learn electrical theories by **applying them**. You familiarize yourself with all auto electrical systems by **working on them**. An apt student can complete the course in ten weeks.

Learn the facts about the demand for electrically trained men. Tear off and mail this coupon for full information on the N. Y. E. S. automotive-electric course.

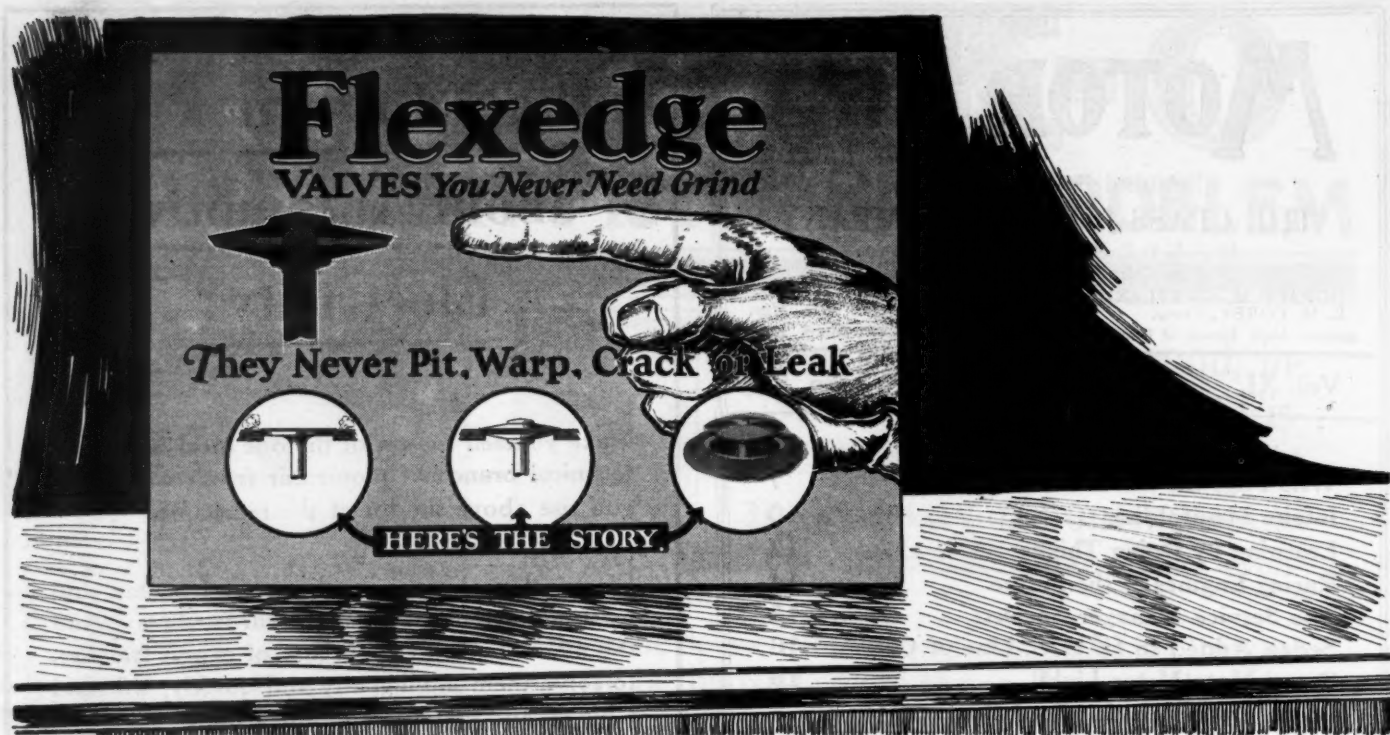
THE NEW YORK ELECTRICAL SCHOOL

36 W. 17th Street
New YorkNew York Electrical School,
36 West 17th Street, New York.Send me prospectus and full details of course in automotive
electricity and your "learn-by-doing" method.

Name _____

Address _____

I am employed by _____



A Sales Maker-Send For It

Get this display stand on your counter or in the window and see how it draws trade. It is handsomely printed in three colors and is a powerful silent salesman that draws no salary. It's a money maker for you. It gets your customers interested in Flexedge Valves.

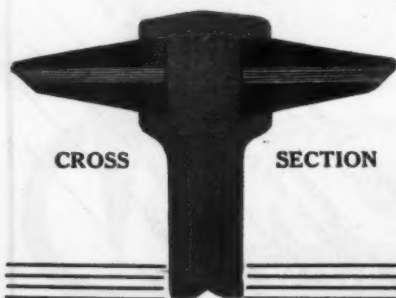
Then when a man asks about Flexedge Valves tell him they never need grinding and always hold compression. Explain that the head is made of laminations instead of one solid piece of metal—that the edges of the laminations flex $1/1,000$ inch on the closing stroke and by so doing free the seat of carbon and keep it clean. That's why Flexedge Valves always seat perfectly and form an absolute compression-tight seal.

If you're selling Flexedge Valves write for this display stand. If you're not you better write for complete details and literature.

SELF SEATING VALVE COMPANY

340 W. Huron St.,

Chicago, U. S. A.



Flexedge

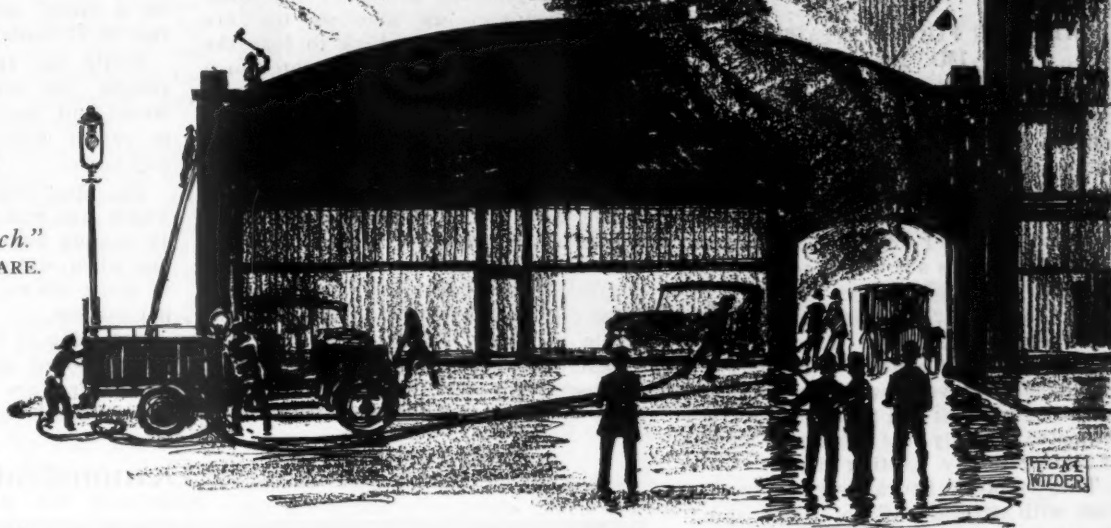
VALVES You Never Need Grind

MOTOR AGE

Who Pays the Bill?

by Tom Wilder

"A little fire is quickly trodden out
Which being suffered
rivers cannot quench."
SHAKESPEARE.



WHO pays the bill? The insurance company, to be sure. Well yes, directly, but all of us who are in the business have been prepaying it on the installment plan for years. Unlike any other installment plan, we pay before we get the goods; in fact, we hope we never will get the goods.

Suppose we engaged to buy a car on the installment plan, paid the installments in advance and for perpetuity and hoped the car would never be delivered? It would be ridiculous but that is just about the same as paying perpetual installments on insurance and hoping never to have a fire.

All insurance rates are based on the risk. On a building in which there is nothing that will burn, the building itself being concrete, steel, and glass, it would be foolish to carry insurance. The risk would be so slight that an insurance company would charge almost nothing.

On the other hand, if the building is wooden, especially if built of small dimension wood-kindling, as it were—and filled with inflammable materials,

*All fires are the same size
—when they start*

paint, varnish, oil soaked waste, gasoline torches, acetylene tanks, upholstery material, gasoline tanks, etc., the risk is exceedingly great and the insurance rate goes skyward in a hurry.

INSURANCE CONCERNS HAVE GOOD MARGIN OF SAFETY

Insurance companies are not gambling—they are betting on a sure thing, as determined by averages. When they bet five hundred to one that your building will not burn down they know they are going to make money on the deal, because, while your building may burn, there are more than five hundred other insured buildings that will not. More than one hundred years of statistics are behind their bets and they always have a good margin of safety.

Fire insurance has become such an intimate part of our modern expense budget that we pay it cheerfully without question; like taxes and death, it is always with us.

There is no reason why this perpetual burden should be placed on business except because of our own neglect in taking precautions.

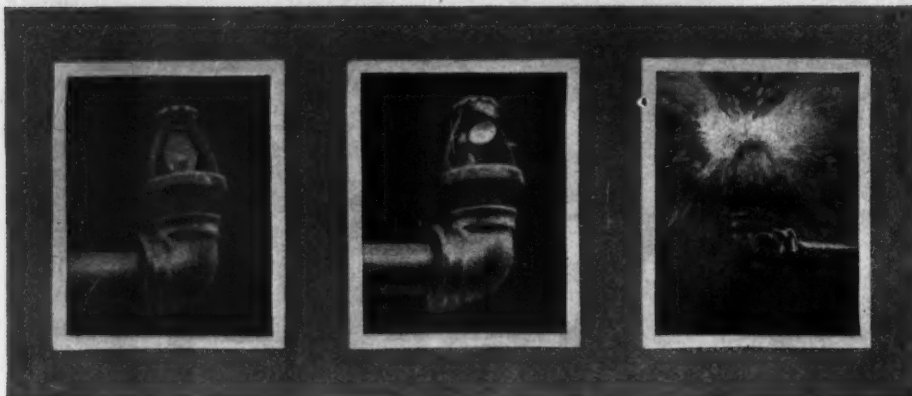
In the United States it is said that \$250,000,000 is lost annually, or about \$10 every second from fires. Add to this the cost of operating insurance companies, maintaining fire departments, inspection, etc., and one gets a hazy idea of the cost of fires. New York state reports show that for 43 years the losses to insurance companies was 58.87% of the premium receipts. These figures give a fair idea of the cost of operating insurance companies.

American business men as a whole, according to Atkinson, an eminent authority, lose 25 per cent of their net earnings through fire. Part of this is the actual loss of property, part is the cost of maintaining fire departments, and the balance, the cost of operating and maintaining insurance companies.

There is no objection to insurance companies' making money; they are performing a wonderful service and deserve pay for doing it. What we want is some way of checking the loss, and turning the money paid out for insurance into useful channels.

There are only two ways now known

Sprinkler Head in Action



Left; getting warm. Center; fusing—note all the parts being thrown out. Right; sprinkling

that can materially lessen the loss, and only one to materially lessen the premiums.

CHECKING FIRE AT START MOST IMPORTANT

Rigid inspection of the premises and compliance with insurance regulations will do much toward reducing hazards and may gain some reduction in the premiums. Stopping the fire automatically within a few minutes of its start is the greatest idea ever advanced in fire protection. All fires are the same size when they start.

It is the start gained by the fire during the minutes before it is discovered that lets it get out of control. And it is this idea that the inventors of the automatic sprinkler systems had in mind when they perfected the only real successful method of automatically fighting fires.

They wanted figuratively to have a man with several pails of water standing ready to quench any fire that could start up, and they have developed a system so that it is possible to have this automatic man call the fire department, ring bells, notify the watchman, start the fire pumps, and any number of things desired.

The automatic sprinkler head is the nerve protecting the building from harm. It is sensitive to heat only, and given more heat than it can stand, it literally explodes or collapses and opens the passage, permitting a downpour of water in which no fire can live. The heads are designed to operate normally at 165 deg., but in some places, such as boiler and furnace rooms, heads operating at temperatures up to 360 deg. are used.

Despite the fact that the building is oil soaked and built of kindling wood filled with gasoline and acetylene tanks and any number of dangers, the insurance premiums can be reduced from 40 per cent to 90 per cent by the installation of automatic sprinklers.

If you pay \$500 a year at present you can have the premium reduced to something between \$300 and \$50, depending on the construction of your building and the completeness of your equipment.

Suppose a bonfire is started with a heap of inflammable material and just as the flames get hot and mount in good

style, three or four well directed pails of water are thrown on it.

This is just the action of the automatic sprinkler—as soon as the fire starts and gets hot enough to fuse the plug, bucket after bucket of water in a regular downpour is dumped upon it, and a conflagration is averted.

AUTOMATIC OPERATION GREATEST VALUE

The greatest value of the system is that it is automatic. If a fire starts from a mouse gnawing a match in the small hours of the night, the action is the same. If the building is full of inflammable material, it makes no difference except that the heat from such a fire is greater at the start, which more quickly fuses the plug and starts the water.

The saving in insurance premiums is so great and so positive that many sprinkler installation companies will finance the installation of sprinklers out of the saving, asking no investment from the owner, but merely the payment of the customary premiums for a number of years.

It is impossible to give here any definite figures regarding reductions in premiums since every building draws a different rate and it is only by consulting the insurance experts that this can be determined definitely. The greater the rate, however, the more substantial will be the reduction; this is because the sprinklers tend to reduce all risks to a common rate. If the building is slow burning or fire-proof, the rate is already fairly low, though the rate on the contents here also gets a big reduction.

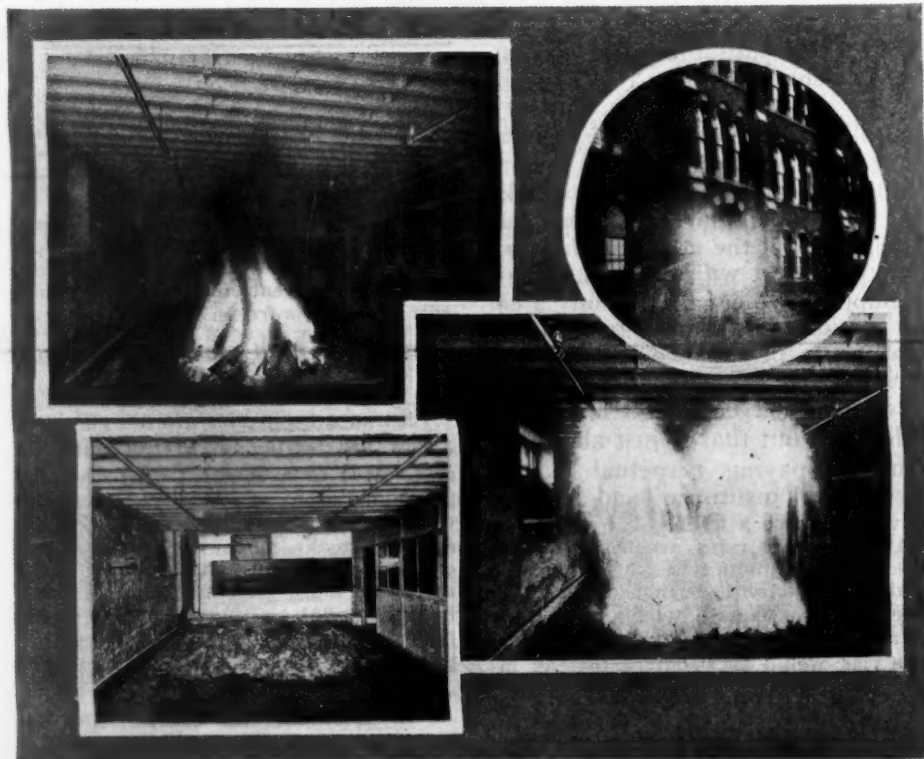
In one instance a man paying a rate of \$1.90, with the installation of sprinklers paid 30 cents, a reduction of 84 per cent. Another paying a rate of \$1.05 on a much better building received a rate of 27 cents, a 74 per cent reduction.

While the sprinkler itself is rather simple, the method of supplying the water and insuring an adequate supply is rather complicated—and sometimes expensive.

The ideal supply is the public system which has sufficient pressure to supply 12 pounds under the roof of the building when water at the nearest hydrant is being drawn at the rate of 500 gal. per minute.

Referring to the regulation of the National Board of Fire Underwriters, we find there are a number of different water supply systems which are avail-

A Conclusive Demonstration



A sprinkler test under open joist ceiling, the most dangerous kind. The fire; the sprinkling; fire out. Circle; demonstrating a sprinkler outside

able, the choice of the most appropriate usually resting with the Underwriters Inspection Department. A standard system must have two supplies, however, one of which is automatic.

AVAILABLE WATER SUPPLY SYSTEMS

There are three principal sources of water supply aside from the public supply which can be used as components of a double supply.

First, the steam rotary or centrifugal fire pump. With ample water supply this will furnish plenty of water at a high pressure as long as needed.

Second, the gravity tank. It must be high enough so that its bottom is at least 20 ft. above the highest sprinklers. Its capacity, of course, is determined by the size of the system and must be approved by the inspection department.

Third, pressure tank, into the bottom of which water is pumped against air pressure. This must not be located below the upper story of the building. Its capacity also must be specified by the inspection department, but should not be less than 4,500 gal. Nothing but the sprinkler system and hand-base leads may be connected to this tank.

Any two of these systems constitute a standard or "double supply" and are considered a 100 per cent equipment. Any one system except the public water supply is considered 80 per cent equipment. The public water supply is considered 50 per cent equipment.

All the systems mentioned should have a convenient outside connection which will fit the equipment of the local fire department.

Connections to public water systems should be controlled by post indicator valves outside the building.

SPRINKLER SYSTEM OF MAXIMUM EFFICIENCY

Of all the fire fighting apparatus in general use there is none that presents a record of efficiency to compare with that of the automotive sprinkler.

It is significant that statistics covering 3,645 sprinkled fires show that in

68.8 per cent 5 heads or less were operated.

9.3 per cent 6 to 8 heads were operated.

12.0 per cent 9 to 20 heads were operated.

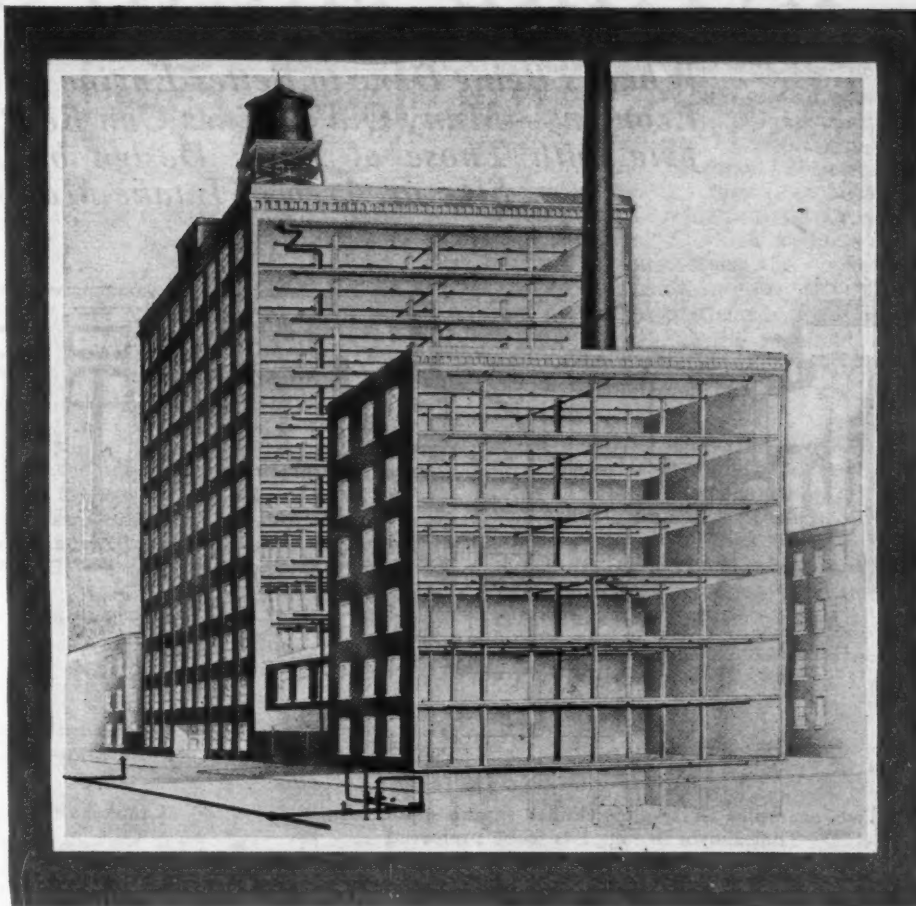
5.2 per cent 21 to 50 heads were operated.

6.7 per cent above 50 heads were operated.

These figures prove the theory of the sprinkler and show that two-thirds of all fires are extinguished at their source or within the zone protected by 5 heads or less. This zone cannot be larger than 500 sq. ft., probably not averaging more than 15 ft. by 20 ft. in dimensions. As a matter of fact, a fire that would start one sprinkler head operating would afford heat enough to start two or three of the adjacent heads before the first head had time to quench it. It is quite probable that one head would have done the business in 2,430 fires (or 68 per cent, the other heads merely acting as reinforcements).

As six to eight heads are enough to put out any ordinary fire, it is reason-

Sprinkler Heads Evenly Distributed



While this is not a garage it might be an automobile factory—it shows the gravity tank well above the roof, the main leading to the basement, city water supply, and sprinkler heads distributed regularly throughout the building, one for each 80 to 100 feet of floor area

able to suppose that in those fires requiring above nine heads there entered some element of human carelessness. Sprinklers cannot sprinkle without water being supplied to them, and if we knew the whole truth about why the other 23.9 per cent of the equipments failed to quench the fire at its start, we might find that water was shut off until the fire gained headway and spread to the area protected by many heads.

In the total recorded sprinkler risk fires from 1897-1917 only 4.7 per cent failed, and as will be seen from the following summary most of the failures may be traced to the human element of carelessness either in designing the equipment or maintaining it.

Cause of Failure	Per Cent	
	No. of Fires	of All Sprinkled Fires
Water shut off sprinklers.....	230	1.26
{ Generally defective equipment	195	1.07
{ Unsprinkled portions.....		
Defective water supplies.....	84	.46
*Exposure or conflagration..	63	.34
Obstruction to distribution..	53	.29
Faulty building construction, concealed spaces, vertical openings, etc.....	39	.21
*Hazard of occupancy too severe for average sprinkler equipment.....	39	.21
*Explosion crippled sprinkler equipment.....	35	.19

Plugged heads.....	34	.18
Not classified.....	28	.15
Sprinkler system crippled due to freezing.....	18	.09
Slow operation of dry system or defective valve.....	18	.09
*Slow or defective operation of "high test" heads.....	15	.08
Total.....	851	4.62

*Legitimate causes, probably outside of all human ability to prevent, constituting only .74 of one per cent of all sprinkler fires. The rest are caused essentially by carelessness.

Statistics compiled from garage risks exclusively are practically the same as those given above covering all risks; the average rate on these risks before sprinkler installation was \$2.33 per \$100, and afterward was 62 cents per \$100, an average rate reduction of 73 per cent.

Strange as it may seem automobile factory installed systems do not make as good a showing in the "Did not Control" column as garages, but this may be due to the small number of fires and an abnormal proportion of bad luck. The following tabulation gives the effect of sprinklers on fires in automobile factories, garages and in general risks:

	Fire Out	Held Fire in	Did Not Check Control
Automobile factories.....	69%	26%	5%
Garages.....	65.2%	31.6%	3.2%
Average of all risks.....	65.36%	30.18%	4.46%

INTAKE MANIFOLDING

What Is Being Done to Better Engine Performance and Economy—Many Old Engines Can Be Rebuilt to Compete with Those of Later Design by Altering Type Size or Area of Intake Manifold

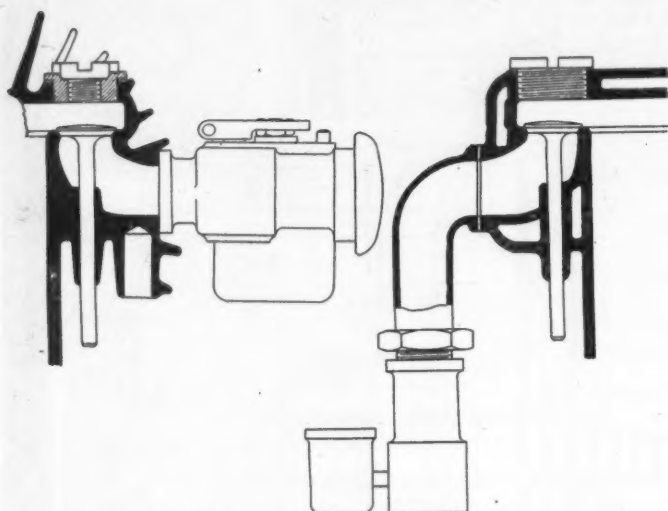


Fig. 1

Fig. 2

Two examples of single cylinder intake manifolding. That shown in Fig. 1 is to be preferred

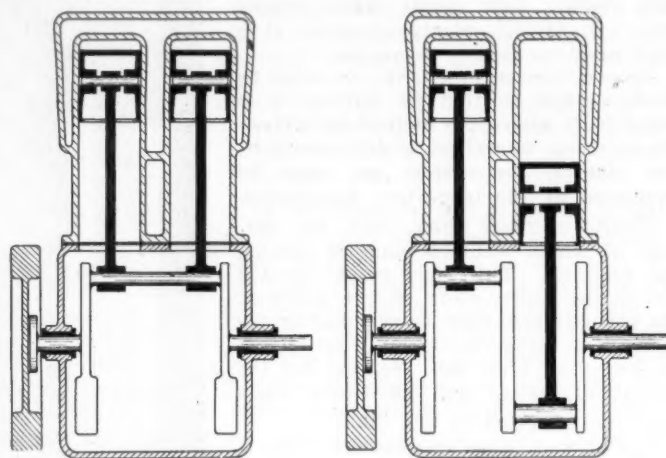


Fig. 3

Fig. 4

Crankshaft design of twin cylinder engines. Fig. 3, 360. Fig. 4, 180

ALL man-made apparatus progresses through alternate cycles of simplicity and complexity with the latter, as a rule, the first stage. In the case of gas engine intake manifolding the usual order has been reversed and has passed through the stages of simplicity, exemplified by the simple, straight intake pipe—up to the present multi-branched and ported conduits which, though they appear simple, require as careful calculation as any part of the engine.

During the early days of the automotive industry almost any sort of a tube would do to conduct the gas of the highly volatile fuels. However, times and fuels change and, in the case of the latter the change has been steadily for the worse. This, coupled with the demand for engine economy, flexibility, power and speed, has set the engine designers many difficult tasks, not the least complicated of which has been the designing of manifolds which will not undo the work of the carburetor by condensing the low grade, present day fuels.

To make these articles clearer it will be necessary to go back a few years, and trace the evolution of the intake manifold from the days of the single and twin cylinder engines. Figs. 1 and 2 are excellent examples of intake pipe design for single cylinder, four stroke cycle engines.

That shown in Fig. 2 was all very

INSTALLING a new intake manifold of a different shape, size or length from the original one will often improve the performance and economy of an old engine.

There are hundreds of service station owners who are being blamed for the poor showing of the older engines, which are well made in all respects except in that of manifolds. These important members may have been and probably were efficient at the time the engines were built.

But times and gasoline change, and, in the case of the latter, usually for the worse. Therefore, a manifold which was all right five or six years ago may be far from efficient today. A study of this simply written series will clear up many points heretofore but hazily understood, and better qualify the service man to advise his customer whether or not the installation of a new manifold will better car performance and economy.

well when 74 and 76 test gasoline was available, but with the less volatile fuels to be had at present the long vertical rise and the two abrupt bends would never do, so this type of pipe has given way to the short, horizontal fitting with the long, slow bend shown in Fig. 1. Another advantage of the latter is that at no time after the mixture leaves the carburetor does it come in contact with the walls of a pipe which would, without fail, chill and condense it. As soon as it leaves the mixing chamber it passes

through the metal of the cylinder casting which, being hot, tends to, although it may not completely prevent condensation.

In the single cylinder engine the effects of poor manifold design are very marked for the reason that the incoming gas is in motion during only one stroke of the four and, after being brought to an abrupt halt by the closing of the inlet valve, lies quiet for a considerable time. If, as in Fig. 2, it is in contact with a long, cold pipe condensation is certain to take place and the next charge will consist of raw gasoline and air in, perhaps, somewhere near correct proportions but almost entirely unmixed.

Passing along to the twin cylinder engines, Figs. 3 and 4, the manifolding problem becomes further complicated by the fact that either of two crank arrangements may be used. That shown in Fig. 3 is known as the 360 deg. setting while Fig. 4 shows the cranks arranged at the 180 deg. angle. Obviously, a manifold which is correct for one is not at all suitable for the other for the reason that with the 360 deg. setting the suction strokes follow each other with an equal time lag between while with the 180 deg. setting the suction strokes occur in rapid succession during one complete turn of the shaft, and there is then a period of a full turn during which the gas is at rest in the manifold.

Then again, considering the 180 deg. arrangement, there are two orders in which the strokes of the cycle may follow each other. Referring to Fig. 4 and considering the cylinder to the right as

number 1, let it be assumed that the engine has a firing order of 1, 2. It is quite obvious that a manifold so designed for this firing order, will not be efficient if used with the other order, namely 2-1.

The reasons for this are plain from a study of Fig. 6 wherein the firing order is 2-1. In this case cylinder 1, following cylinder 2 immediately draws in the gas that has condensed at point "b," Fig. 8, while cylinder two, on its next intake stroke, gets the fuel condensed at "a." The result is that both cylinders get about the same quality of mixture. Were the firing order 1-2, cylinder number 1, being the first to intake after the idle interval, would draw an over rich mixture from the condensation points "a" and "b," while cylinder two, drawing directly from the carburetor, would receive a lean mixture. Therefore, with the latter firing order the manifold would have to be the reverse of the one shown in Fig. 4, with the carburetor attached at the left. Likewise, the cam layout, shown in Fig. 7 would need to be reversed number 1 cam leading number 2.

As may be well imagined the manifold shown in Fig. 5 designed for the 360

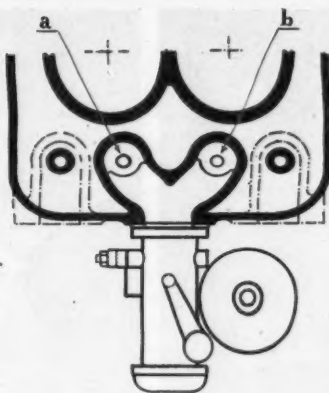


Fig. 5

Intake manifold of twin cylinder engine with cranks set at 360

deg. engine would be not at all suitable for the one under consideration.

The problem of manifolding for four-cylinder engines are still more complicated. Two early methods, which are now obsolete but still to be found on many of the older models of cars, are shown in Figs. 9 and 10. These are both bad and making a choice between

them is a matter of the selection of the lesser of two evils.

That shown in Fig. 9 has the advantages of offering a shorter path and one less bend. The fault with Fig. 10 aside from the too long path, is that condensation takes place at "b" and upsets the mixture completely. A makeshift which remedies the condition somewhat is shown in Fig. 11. Inside the large diameter pipe "A," which carries air only is the small pipe "C" which conducts a rich mixture directly from the carburetor. The two streams meeting mix with a fair degree of thoroughness in the remaining length of the manifold. This arrangement also improves starting, as the large diameter pipe can be choked at its inlet.

However, the method is a makeshift at best and it is recommended that manifolds of either type shown be relegated to the junk pile and supplanted with one of those shown in Figs. 12 and 13 the choice depending upon whether the cylinders are cast separately or in pairs and on the firing order.

The next chapter of this series will appear in the August 11 issue.

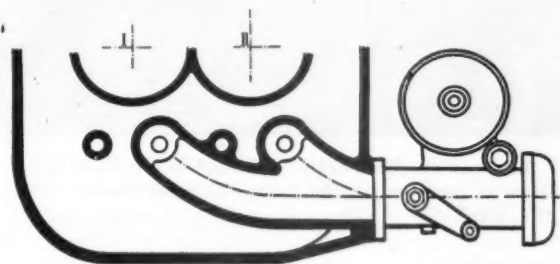


Fig. 6

Intake manifold of twin cylinder engine with 180 crank setting



Fig. 7

Cam setting and correct manifold for twin cylinder 180 engine with a 2-1 firing order

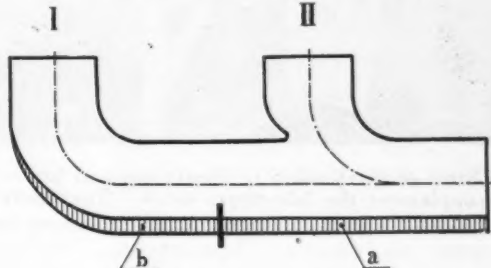


Fig. 8

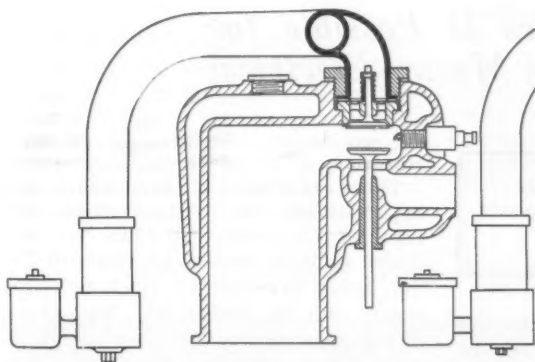


Fig. 9

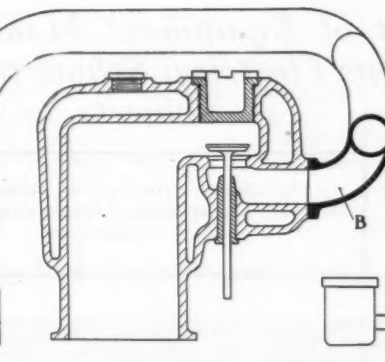


Fig. 10

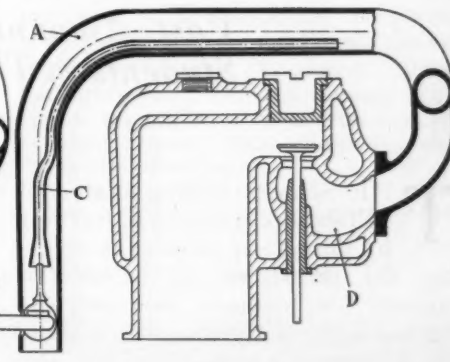


Fig. 11

Faulty and obsolete manifolds used on early models of four cylinder engines. The long exposed pipes make starting hard and condensation excessive

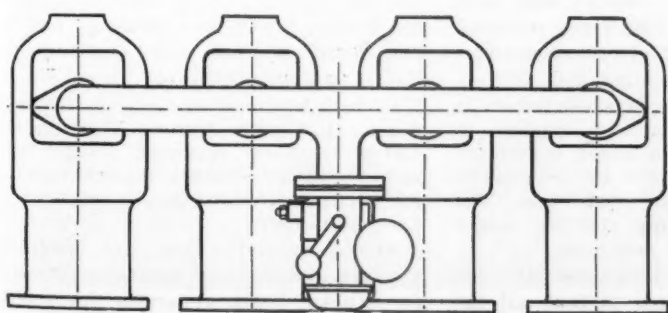


Fig. 12

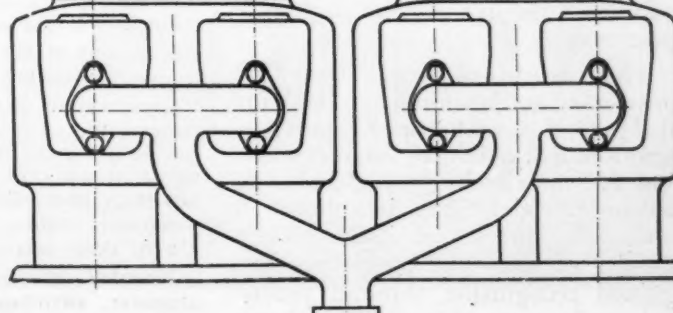


Fig. 13

Improved types of manifolds for four cylinder engines. These can also be improved as the long, unheated pipe offers a large condensation area



Some pictures taken in classrooms and laboratories of the School of Automotive Electricity, Milwaukee. Chalk talks supplement the laboratory work. The lower right hand picture shows a portion of the battery department. The upper left hand picture shows the faculty

Learning By Doing Things

Vast Amount of Equipment Makes It Possible for Students in This Electrical School to Master Electrical Subjects

THE School of Engineering of Milwaukee believes in learning by doing. It believes in teaching the principles of the electric starter, for instance, not only by having men study the principles of the electric starting motor, but also by having them examine dozens of types of starters, having them operate the starters in order that they may learn the use of them in a practical way.

The institution went about the project of establishing a school for training men to become experts in ignition work, in gas engine starting and in all the special fields of automotive electricity, in a thorough way. It surrounded itself with a faculty of men who previously had gained recognition through practical work or teaching. Then large laboratories were created, and it is doubtful whether there is existing

Intelligent training of hands and brains means better automotive maintenance.

today an institution devoted to the teaching of automotive electricity which has more equipment than this school.

Take, for instance, the starting and lighting laboratory. Here one sees dozens of tables on which are mounted the various makes of electrical systems in use for starting, lighting and ignition.

Examination of one of these tables is interesting. The layout is similar to the final layout of the same equipment on an actual car. There are headlights, tail light and even the dash light. The generator, cutout and starting motor are in their relative positions.

Mounted on the dashboard are the ammeter, switches and, in fact, all the customary devices found on the car. All the wiring is in sight so that one can see exactly how the system is laid out.

There are dozens of these tables showing Auto-Lite for Willys-Knight, Auto-Lite for Chevrolet, Auto-Lite for Allen Model 43, Bijur system for Packard Twin Six, Delco two unit for Nash Six, Delco single unit for Buick Six, Delco 6-volt-24-volt system for Cadillac Eight, Dyneto single-unit for Franklin, Dyneto two-unit for Crow-Elkhart, Heinz-Springfield for Ford, Ford two-unit standard equipment, Leece-Neville for Haynes Twelve, North East single-unit for Dodge, North East two-unit for Reo Six, Remy two-unit for Oakland Six, Remy two-unit for Kissel Kar, Simms-Huff with magneto ignition for Maxwell, Simms-Huff with Atwater-Kent ignition (latest type) for Maxwell, Wagner two-unit for Studebaker Six, Wagner two-unit for Elgin Six, Westinghouse two-unit for Dort, and others.

Among special tables are Eisemann ignition and lighting magneto generator for trucks, Vesta generator for trucks, Remy single-unit starting, lighting and ignition system for Moline Universal tractor, K-W generator for tractors,

Delco-Liberty ignition systems for Liberty Twelve aircraft engine, Remy ignition and lighting system for Harley-Davidson motorcycle, Splittorf ignition and lighting system for Indian motorcycle. On other tables are various types of electrical accessories.

In the storage battery department there is apparatus for tearing down and rebuilding batteries, charging, etc. Old batteries are taken apart by the students in the study of their structure. For those who want to go into the subject intensively there are courses in chemistry with much additional equipment.

All the various types of magnetos are mounted on tables in the magneto laboratory. Among other things it contains the following equipment:

Battery Ignition Systems—Atwater-Kent; open and closed circuit types (consisting of seven models); the Connecticut; the Remy; the Delco for 4, 6, 8 and 12 cylinder engines; the North-East; the Philbrin; the Wagner, and the Westinghouse.

Low-Tension Magneto Ignition Systems—The Splittorf; Remy; Briggs; National; Ford; Eisemann; K-W; Kingston; Michigan and Webster oscillating type.

High-Tension Magnetos—Berling; Bosch; Eisemann; Heinz; Kingston; Laurine; Mea; Simms; Dixie, and K-W, including all models of each make for service on automobiles, trucks, tractors, motorboats, motorcycles and aircraft.

Then there is the special investigation laboratory where problems are taken up and studied. Here Professor E. L. Con-soliver, director of the school, and the other members of the staff perform special experiments and make various investigations. Advanced students use the laboratories also. Mounted here are typical farm lighting electrical apparatus of various kinds.

In addition to a large amount of starting, lighting and ignition equipment, the starting and lighting laboratory is completely equipped with testing apparatus of all kinds, including test-stands for making running tests of a complete starting, lighting and ignition system; armature testing devices; field testing

Training Automotive Mechanics

THIS article is the third of a series dealing with some of the automotive schools of the country. It is becoming realized more and more that the mechanics of the future who would succeed in the automotive repair business are those whose practical experience has been supplemented by educational training. Again, there are those just starting out in the maintenance division of the automotive industry, and for them a course in some good school where they are taught both theory and practice is of great value. The accompanying article tells of the way in which the School of Automotive Electricity of Milwaukee carries on its work.

Since the starting of this institution as the Automotive Department of the School of Engineering of Milwaukee in March of this year there have been over 700 students, coming from practically all the states of the Union and from England, Canada, Mexico, Brazil, Australia, Japan and other countries.

apparatus; magneto and charging sets, etc. The storage battery department is also completely equipped with all the modern devices for charging, testing, and repairing storage batteries, similar to that required by any up-to-date battery service station.

To give the students as practical experience as possible, the laboratory contains engines of different types mounted for ignition, starting and lighting experimental purposes, as, for example, Ford, completely equipped with the latest Ford starting and lighting systems; the Cadillac four-cylinder 1912 model, equipped with the Delco 6-volt-24-volt system, representing the first engine on the market with starting and lighting equipment as standard installation; two Hall-Scott airplane engines; and a four-cylinder motorboat engine.

Convenient to the automotive electric-

ity laboratories is the automotive electro technics lecture room, equipped for presenting problems to groups of students.

By the system of chalk talks, the student is thoroughly equipped before he enters the laboratories.

In the laboratory the students work in groups of three in performing the different tests. The student proceeds through the laboratory tests in the following order: electricity; electrical circuits; magnetism; battery ignition systems; low-tension magneto ignition systems; high-tension magneto ignition systems; storage battery charging, testing and rebuilding; starting and lighting systems; armature winding; farm lighting plants; special starting, lighting and ignition equipment for aircraft, motorcycles, tractors, motorboats, etc.

The laboratory work is supplemented each day by chalk talks and practical demonstrations by the instructors, to give each student a thorough understanding of the fundamental principles of the subject. Examinations are given at regular intervals to ascertain the progress of the student in his laboratory work. Each student keeps a notebook containing daily record of all experiments, tests, diagrams, etc., which he obtains in his laboratory work.

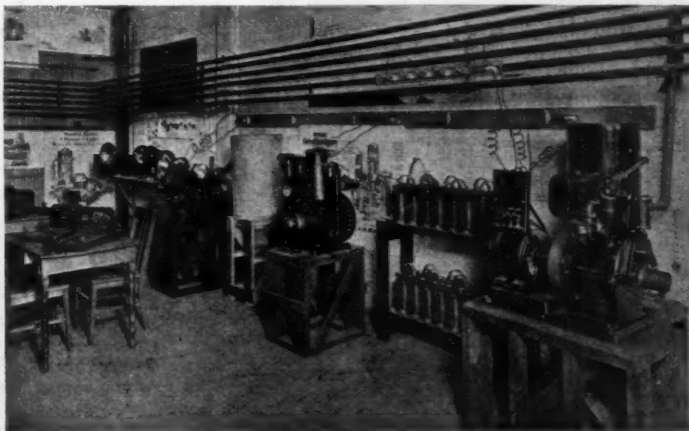
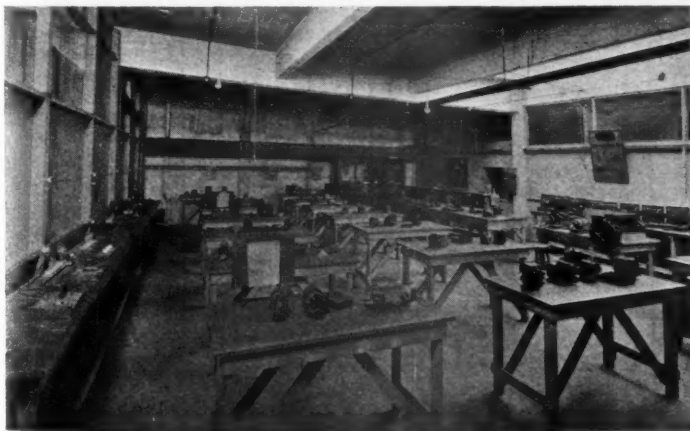
Students who wish to take courses in automotive electricity have various requirements and have various amounts of time which they can spend. Consequently, instruction is given under three different plans:

The three-month course is a highly concentrated, intensive, specialized course, requiring the full time of the student all day and covering the complete courses outlined on the previous pages.

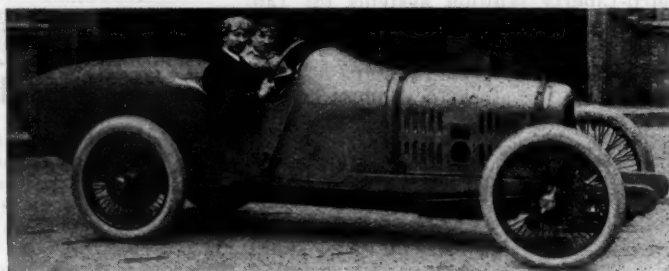
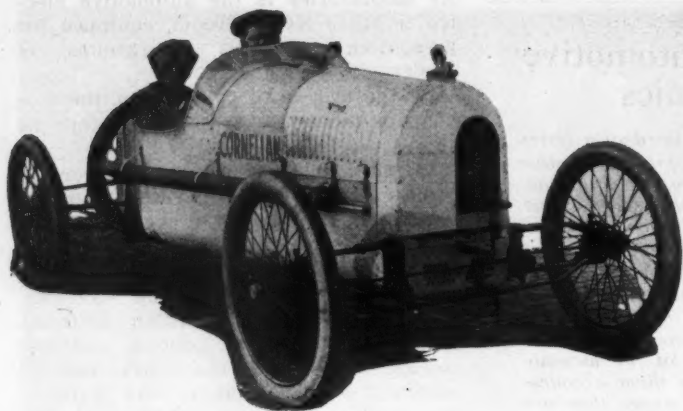
Since some students wish to earn a part or all of their expenses, this course is also given in a six months alternating week plan, wherein the student studies the first week, but the second week spends his day at work and his evening at night school. This course includes mechanical drawing.

A night course from 7:30 to 9:30 o'clock two nights a week is also offered.

Well Lighted and Arranged Laboratories of Milwaukee School



At the left is shown a view in the magneto laboratory. The other view shows several types of isolated light plants used for study purposes



Left, Louis Chevrolet in the Cornelian, the smallest car ever run in the Indianapolis race. Its piston displacement was 114.6 cu. in., yet it qualified at 81.1 m.p.h. The car at the right is the 122 cu. in. Ballot driven in the French Grand Prix last week by Jules Goux. It finished third.

Racing Engines of the Future

Probabilities Are the 122 Cu. In. or 2-Liter Engine Will Be as Fast or Faster Than Its Predecessors—High Crankshaft Speed Demands Best Materials and Design

THE fact that the management of the Indianapolis speedway has seen fit to restrict the 1923 500-mile Hoosier classic to cars fitted with engines of not greater than 122 cu. in. piston displacement, has been productive of much discussion as to whether or not cars fitted with such small engines will be as fast and stand up as well on the track as their predecessors of 183 cu. in. and larger.

Some light can be thrown on this subject when past performances of the cars are studied. Since the first running of the Indianapolis race the piston displacement limit has been changed four times—five times, including the present ruling of the management regarding the 1923 cars.

At the same time, the average speed has not decreased along with the reduction in piston displacement, but, on the contrary has increased. The record for the distance is held by a car with a piston displacement of 274 cu. in., this being the Mercedes driven by Ralph De Palma in 1915. The car covered the 500 miles at an average speed of 89.84 m.p.h.

However, Tom Milton, in a Frontenac of 182.5 cu. in. piston displacement, covered the distance in this year's race at an average speed of 89.62 m.p.h., or only .22 m.p.h. slower. In other words, the Frontenac, a car fitted with an engine of 91.5 less cu. in. displacement, practically was as fast as the Mercedes. Perhaps had Milton crowded his car a little more he easily might have set a new record for the race. In fact had the Ballot driven by De Palma this year not fallen by the wayside it is a certainty the car would have set a new record, inasmuch as it was breaking all previous marks up to the time of its withdrawal.

Again, it is possible to go back to

1915 and look over the performance of the Cornelian, the smallest car ever entered in an Indianapolis race. This car was built under the supervision of and driven by Louis Chevrolet. It was fitted with a Sterling engine, 2.93 by 4.25 in., which with four cylinders gives a piston displacement of 114.6 in., or just under the 122 cu. in. size set for 1923.

SMALL CAR HAS HIGH SPEED

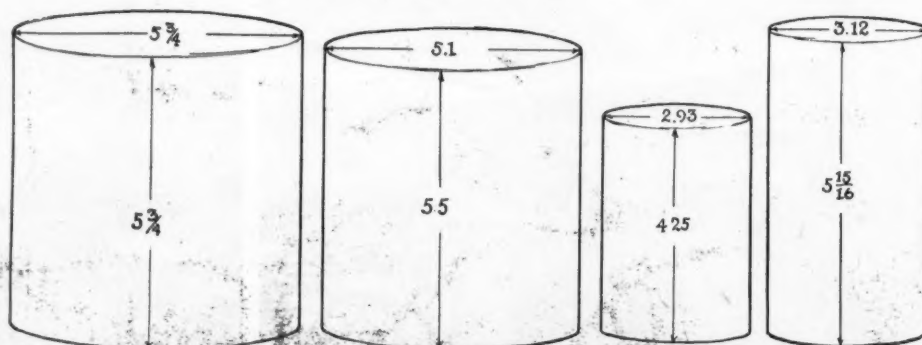
Although the Cornelian was not a serious contender in the 1915 race, it is interesting to know that this small car was driven in the qualification trials at 81.1 m.p.h. The driver of the car during the time trial was Joe Boyer.

In view of what has been done before, it is reasonable to believe that the 122 cu. in. or 2-liter engines will be just as fast or faster than the 3-liter or 183 cu. in. engines. It may be the 122 in. engine will not show up to its best in the first race it is used, but in 1924 there should be some really fine performances. It did not take the 183 in. engine very

long to make good as compared with the 300 in. engine, and no doubt history will repeat itself.

One thing is certain and that is that the 122 in. engine will have to be designed and built even more carefully than its predecessors. Automobile engine designers—at least many of them—state the frictional losses are greater in a small engine run at high speed, and high speed is one of the first essentials of the 122 in.

The smaller engine, being necessarily lighter, must be made of the best materials. Oiling problems for such an engine become quite acute, because of the high rotative speed, and especially where this speed has to be maintained over long periods. The cooling of the cylinders, ignition, etc., are just as important. In an engine traveling at several thousand revolutions the reciprocating parts, like piston valves, etc., move tremendously fast and it becomes no small problem to work out gas passages and manifolds to cope with the inertia of the rapidly flowing gas.



This gives some idea as to how the piston displacement has varied in the cars raced at Indianapolis since 1911. It shows the bore and stroke of some of the cars, all four-cylinder. Reading left to right, the diagrams show the volume swept by one piston in the engines of DePalma's Simplex in 1911, Disbrow's Case in 1916, Chevrolet's Cornelian in 1915 and the Monroe driven by the late Gaston Chevrolet in 1920.

The SERVICE MANAGER Speaks:

Here Is One Who Thinks the Flat Rate System of Service Is Not Fair to All Classes of Customers

I HAVE read with great interest the articles by service managers in recent issues of your valued journal, and I sincerely believe that a department, such as you have inaugurated will be of great benefit to service managers and, indirectly, to the industry. Unfortunately, in the past, service managers have not traveled as extensively in the interest of their business as their brother executive the sales manager, and, hence, have not had the benefits that result from personal contact and interchange of ideas.

I have recently given some thought to a subject with which I am not directly familiar and I would like to obtain the views of other service managers possessing practical knowledge on this subject. I refer to the wisdom of adopting in our shop the flat rate system of charging for repairs.

The few service managers I have interviewed regarding the flat rate system have invariably said it was a vast improvement over the old method, but, when I inquired in what particular it was a betterment, they have informed me that "the customer knew in advance what the bill would be, which eliminated complaints." Their replies set me to questioning if the elimination of complaints as to the amount of the repair bill was the principal desideratum in operating a maintenance station.

Meditating further, I question if the flat rate system of charges is not only a temporary method of satisfying the public until such time as the public becomes just a mite more "motor wise." It occurs to me that the maintenance station should have a long range vision and adopt that policy which will give continued satisfaction, not alone now, but, in years to come—that the maintenance station should not follow the line of least resistance and employ methods that will be obsolete in a few years and ultimately injure its prestige with the motorist.

FLAT RATE BEST FOR BUSINESS

The father of the flat rate system said that the chief merit of this system lay in the fact that "the American was accustomed to doing business on a fixed price basis, and that you must do business as the public desires, whether you sell automobile repairs, or shoe repairs. The shoe repairer's prices are invariably the same."

My experience with the public, gained largely through a large maintenance station, is that you must be absolutely fair, sincere and straightforward, or, no matter how sincere and open you may appear, the public quickly detects the false

Page the Flat Rate Exponents

THE article herewith was written by a service manager who wishes his name withheld because he thinks some of his arguments are hoary with age and long ago have been shot to pieces. The editors of Motor Age rather feel, however, that his letter, written for this page, contains some points which, while they may have been discussed at various times, can still stand much more discussion.

We are complying with his request to withhold his name but we certainly hope other service managers, especially those now using the flat rate system, will pick up this gauntlet thrown at their feet and engage in further discussion. Some of you have used this system a long time and surely have found out a lot of things for or against it. The writer of this article says he has an open mind towards the flat rate system; here is a chance to sell him.

note. Deception, no matter how insignificant, is unconsciously perceived.

Now, it appears to my mind that there are many injustices in the flat rate system. I don't see how anyone familiar with automobile repairing can contend that the same repair operation on any two cars, irrespective of condition, is worth the same amount. Yet that is the natural impression the customer receives under the flat rate system.

There are three variables entering into automobile repairing, which, in a casual investigation of other trades where fixed prices are quoted, I find but two. The variables entering into automobile repairing are:

1. The workman (his ability.)
2. The thing to be repaired (its condition and material required.)
3. Working condition (equipment and facilities.)

In automobile repairing we can control variables 1 and 3, but 2 is in the hands of the owner. If we could ignore 2, the flat rate system would be to my mind feasible, because the product of variable 1 times variable 3 should always be a constant in any given shop, for the cost to us for the labor expended would not vary, for the reason that the mechanic's rate per hour, multiplied by the time consumed, should always be a fixed sum—a rapid mechanic at a high rate per hour and a slow, incompetent mechanic at a low rate per hour.

But to return to the analogy used by the leading exponent of the flat rate—

the shoe repairer. Is it not true that all shoes take practically the same amount of leather and require the same amount of time to stitch, variables 1 and 3 alone entering into this repair? Everything is visible.

On the other hand, we had two cars of the same make and model in our service station a few days ago, both with bent axles. The first was owned by what we term a "good customer." He has his car oiled periodically, keeps it well groomed and comes to us from time to time for suggestions as to needed repairs, doing what we recommend. The result was that it took exactly two and a quarter hours to remove and replace his axle.

Our other friend is a countryman, residing on dirt roads. He comes to us only when something goes wrong. His car is encrusted with rust and dirt and is seldom oiled. To remove and replace his axle took two men five hours and they were compelled to heat the steering knuckles red to remove the king pins and chop off the spring clips. Where is the fairness of charging an average between these two repairs? Today, both men may be satisfied with their respective bills "because they were told in advance what the charge would be," but, how about the future when they become somewhat more "motor wise?"

FIXED PRICE RATE SATISFIES CUSTOMERS

But those who extol the virtues of the fixed rate system inform me that the fact that they can tell a customer in advance what his bill will be, is sufficient advantage to neutralize all the disadvantages. But, do they tell the customer? I think not. They only state what the labor component will be and you or I are not interested in what the labor charge alone will be. We are interested in knowing what we will have to pay—the total amount of our bill. A Ford service station gave me a flat rate operation charge of \$23—the bill was \$78. The flat rate didn't avail much.

There is another feature on which I desire some enlightenment and that is, in calculating the flat rate charge on any one operation, lost time, stopping, starting, testing, etc., must be taken into consideration. If the customer orders a number of unrelated operations, does he pay for the lost time multiplied by the number of operations?

One of the most clinching arguments advanced to me by a successful service manager was that practically all large, successful agency shops use the flat rate system. But would not these self-

(Concluded on page 17)

Sedan Added to H. C. S. Line of Cars

Wire Wheels Are Standard Equipment and Two Spares Are Included.

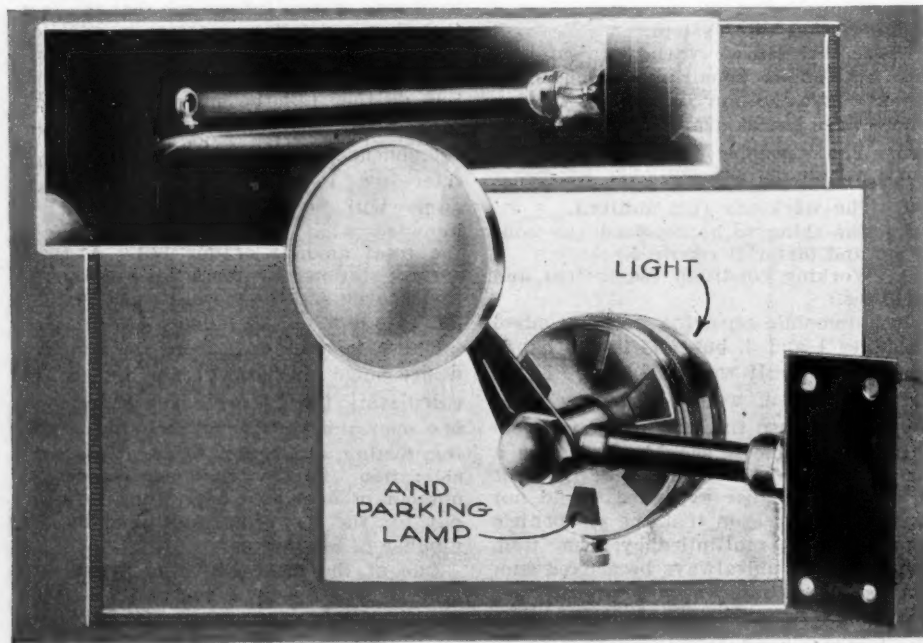
BEAUTY of line and appointments combined with ruggedness of construction characterize the new H. C. S. four-passenger sedan, the latest offering of the designer, Harry C. Stutz. Mounted on the well known H. C. S. chassis, the body proper is of full aluminum and is upholstered with a rich, blue hand buffed Spanish leather in the front seats, while the rear seats' upholstery is of broadcloth.

The plate glass panels of the windows and doors are adjustable, as are also the rear and side window shades, and the wind shield is equipped with a visor as a protection against sun glare and rain. Standard equipment in the form of two extra wire wheels completes an ensemble calculated to appeal to the taste of discriminating motorists.

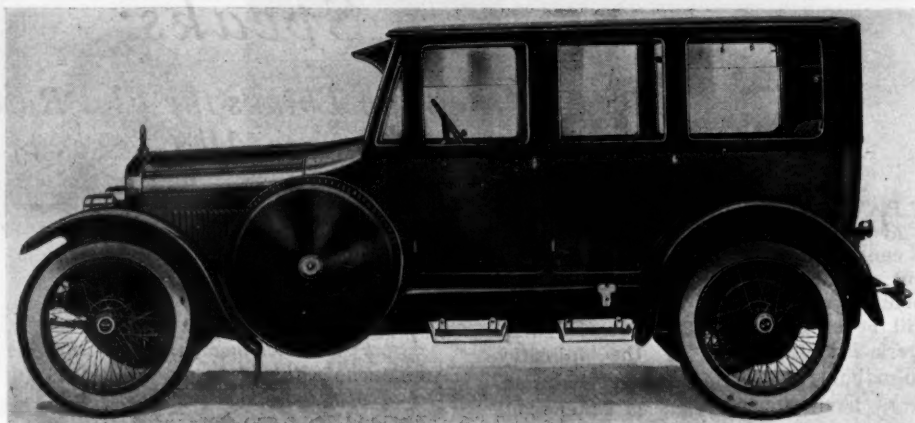
As will be noted from the illustration, the sedan is of the two-door type, with individual aluminum steps placed under each door, as in the touring car model. The new sedan takes on quite a distinct European look, inasmuch as the body height has been kept low. This, however, has not been done at the expense of ample headroom.

BOYCE MOTO-METER LIGHT

TO meet the demand for a practical means of illuminating the moto-meter for night driving, the Moto-Meter Company, Inc., Long Island City, N. Y., has brought out the Boyce-Moto-Meter Light and Parking Lamp. The illustrations herewith show the installation of the light.



New Moto-Meter light and parking lamp brought out by the Moto-Meter company



The new sedan recently added to the H. C. S. line. It is claimed for this car that it is not only a luxurious town vehicle, but so built as to stand the strain of cross-country touring

The lamp is so constructed that it directs a strong beam of light on the face of the moto-meter. It is stated that the light is so directed that there is no reflection possible that would tend to confuse the driver.

This light may also be converted into a parking lamp. By turning the rear disk about one-half inch, six rear red windows are opened which give a red danger signal that can be seen a great distance. An ingenious shutter at the rear renders the red parking lamp invisible while driving.

The light and parking lamp is adjustable to any car, as by the introduction of a revolving lens it has been found possible to cast a beam of light directly on the face of the moto-meter. It is particularly interesting to note that only a 2-c.p. tail light bulb is required. This fact has enabled the manufacturers to combine

the moto-meter light with the parking lamp, thereby eliminating the burning of three lamps while the car is parked.

The combined moto-meter light and parking lamp lists at \$6. A mirror may be supplied at \$1. The entire device is made of brass, nickel plated throughout. Two brackets enable it to be readily attached to the windshield of either open or closed cars.

BOSCH EQUIPMENT FOR FORD CARS AND FORDSON TRACTORS

New Fittings Quickly Adapt Famous Apparatus to These Popular Vehicles

BY means of especially designed fittings Bosch D. U. 4, B 4 or Z. R. 4 magnetos can be quickly installed on Ford passenger cars, and the Z. R. 4, D. U. 4, and D. U. 4 T. models of the well known apparatus can be adapted to Fordson tractors.

The new fittings are extremely simple, consisting of forged magneto supporting brackets, a worm driving gear which takes the place of the standard timer brush, a housing for the latter part, and an extension shaft which transmits the drive from the camshaft to the magneto through the medium of three worm gears. Besides these principal parts extra bolts and nuts, spark advance control rods and other minor pieces are supplied with each outfit.

Plainly written and clearly illustrated instructions are also furnished, so that any mechanic or mechanically inclined car or tractor owner can make the installation with every assurance that it will be successful. The outfit is very compact as it is so designed that the magneto barely clears the left side of the engine block, near the top and front, the driveshaft being arranged to cross the front of the engine and rise to the magneto at an angle of about 20 degrees.

At the time of installation both sets of worm gears, those at the lower and the upper end of the shaft, are packed

with soft grease. All lubrication thereafter is effected by means of a grease cup, attached to the driveshaft protecting tube which keeps the latter filled, and, through it, the worm gear housing. The magnetos of course, supplant the regular ignition system completely eliminating the four vibrator coils on the dash, the timer and the primary wire loom with its four timer leads. On the older model cars the Ford magneto is used for lighting purposes only and on the newer models, equipped with a starting and lighting system it has no use at all other than serving its secondary purpose, that of a flywheel.

The illustrations on this page give some idea as to the accessibility of the outfit. The interrupter and distributor are easy to get at for purposes of adjusting or dressing the points, installing new brushes, etc. Also, should it ever become necessary to remove the entire magneto this can be done readily, as there are no couplings, etc., to undo.

PREMO ROADSTER IS BUILT ON STOCK "MAGIC SIX" CHASSIS

MOUNTED on the stock "Magic Six" chassis which for two years has proven its worth in the touring car, the Premo car roadster, the latest model to be announced by the Preston Motors Corp., Birmingham, Ala., is attracting favorable attention both in the domestic field and in export circles. With a 7 in. channel section frame as the basis, the chassis is made up of such standard units as the Falls engine, Muncie transmission, Timken axles, Borg and Beck clutch, Spicer universal joints, Stromberg carbureter, Connecticut Ignition, Wagner starting and generating apparatus and Willard battery.

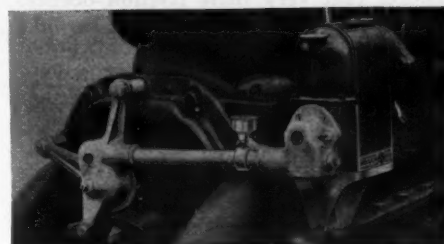
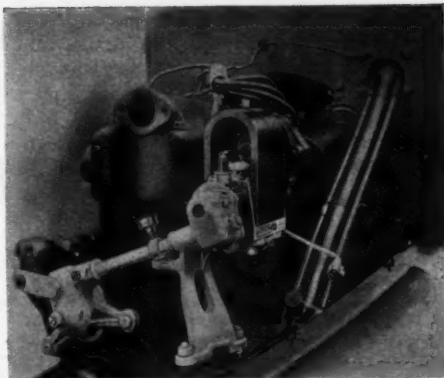
Several features are incorporated in the new roadster that should make it prove quite popular in the light car field. It has a large, roomy seat, wide doors and a compartment behind the rear cushions for carrying the curtains and packages. The big feature is the unusually large rear compartment. The lid lifts up over the entire rear section which enables the driver to place a steamer trunk inside if he so desires. There is plenty of room for suit cases, grips, bags, packages and the like. This roomy compartment means a great deal to business men and salesmen who generally find it necessary to carry quite a few things with them on their business trips.

Although the standard color scheme of the Premo car is maroon for the body set off by a rich shade of cream for the wheels, finishes are optional with the purchaser. The price is \$1295 F. O. B. Birmingham.

THE SERVICE MANAGER SPEAKS:

Concluded from page 15

same service stations be even more successful if they thoroughly worked out and adopted the maximum estimate system? Is it not their equipment and personnel that made them successful and not the flat rate system, and will not their prestige wane when the public discovers it is paying for either more or less hours of labor than it actually receives?



Two new Bosch products. They consist of a shaft drive mechanism for Bosch magnetos for Fords and Fordson tractors

I have been told by the flat rate exponents to ignore the hour basis—to charge for the operation; but the world operates on an hour basis. All construction and repair work is done on the hour basis. The very repair part that enters into the repair on your car is charged for, based on the cost of raw materials, plus labor of machining, plus overhead. The carpenter who built your garage, the contractor who laid your drive and the plumber who installed your drain, charged on the hour basis. You either pay or are paid for labor on the hour basis.

I have been told "I think too much for the customer"—but, is it not true that, as the customer becomes more familiar with his car, more conscientious regard for his rights should be given than the flat rate appears to give. Now, perhaps it is true that I take the idealist's view and am not sufficiently commercial, but I have no prejudices and flatter myself that I have an open mind toward the flat rate system.

ELECTRICAL BENCH HAS NOVEL SHAFT DRIVE

THE latest comer in the field of automotive electrical testing equipment is the T. D. No. 4 Universal Test Bench, manufactured by the Quality Electrical Products Co., Kansas City, Mo. The unique driving feature of this machine is the four bar parallel bracket arrangement which holds the driving head and chuck parallel to the holding vise at all positions through a vertical misalignment of 6 degrees and a deviation from the horizontal of 12 degrees. This permits the machine being tested to be instantly clamped in the vise and, since the latter is free to move forward or backward from the chuck, it is unnecessary to raise, lower or move to right or left the machine undergoing the test, the flexible shaft and parallel bracket compensating for any misalignment.

All this is made possible by the fact that the driveshaft is fitted with two universal joints which have the same centers as the four bars of the parallel bracket. Owing to the care exercised in the machining and assembling of the universal joints, they are exceptionally free from friction and transmit uniform speed regardless of the angle through which they are operating, with the ranges above specified.

The holding vise is also something of a departure in design, both jaws being equipped with pawls fitting into the teeth of a ratchet which is a part of the guide rack. One of the pawls is fitted with a hand wheel which serves to firmly lock the vise jaws after these have been brought into position encircling the generator or starting motor.

To release the tested unit it is only necessary to loosen the pawl with the hand wheel and raise both pawls out of engagement with the rack. This permits opening the vise jaws to their full width. The assertion is that these features enable the operator to clamp, chuck and drive any kind or make of magneto, generator or starting motor in less than one minute.

Another feature claimed is that as the chuck is free to move in any direction, there is never at any time an undue strain put upon the end housing

Concluded on page 18



The new Premocar recently introduced by the Preston Motors Corp., Birmingham, Ala. It costs the same as the touring, \$1295

ELECTRICAL BENCH HAS NOVEL SHAFT DRIVE

Concluded from page 17

or bearing of the machine being tested. The object of this arrangement is to avoid end thrust upon the metal or thin die cut end housings which are incapable of withstanding severe end strains.

Equipped with a 1 hp. motor, the single unit friction head, mounted in a one piece casting direct to motor frame, has a speed variation from 0 up to 3,600 r.p.m. in either direction. Inbuilt into the friction transmission is the tachometer which is direct reading in terms of revolutions per minute. The switchboard testing panel is equipped with two ammeters, the lower range instrument reading 30-0-30 amp., and the higher reading 600-0-600 amp.

Other items of the switchboard equipment are a 0-30 voltmeter, a single pole double-throw knife switch, two three-point spark gaps complete with terminal leads and clips, binding posts and leads to test generators, heavy cables and terminals for testing motors, and battery terminals leads and bending posts for connecting up either 6 or 12 volt batteries. The accompanying illustrations show the test bench complete as well as close-up views of the improved details.

WATSON STABILATOR

A NEW type of shock absorber in which the resistance to spring action at the normal position of the spring is very slight and which increases as the spring deflection increases, has been put out by the Jno. Wallen Watson Co., 24th and Locust streets, Philadelphia, Penn. The new shock absorber known as the Stabilator, depends on friction for its operation, the friction being secured between a brake band and shoe, which is so mounted and designed as to afford varying degrees of friction on the location of the spring.

The illustration shows the parts of the shock absorber. The brake drum and housing are stationary. Surrounding the brake drum is a brake band, around part of the circumference of which is a pull strap which is connected with the axle members. The tension on the brake is regulated by a coil spring which is held at its inner end by a slot in the hub of the shock absorber. At the outer end there is a hook which engages with the end of the brake shoe. As the spring takes up its normal position under the ordinary load of the car, the brake band is unwrapped from the shoe to such a position that very little friction occurs, because of the fact that there is only slight engagement between the brake band and shoe. This unwrapping is done against the tension of the spring. When an obstruction in the road is struck, causing the axle to lift off the ground, the spring tension causes the brake band to wrap around the drum just as rapidly as the pull on the strap is released, due to the flexure of the spring. The friction between the band and drum prevents the rapid rebound which would ordinarily occur, due to the potential energy in the leaf spring. As a result, the spring is allowed to return slowly to normal position, the resistance to its action tapering off gradually, as the amount of contact between the brake band and drum increases.

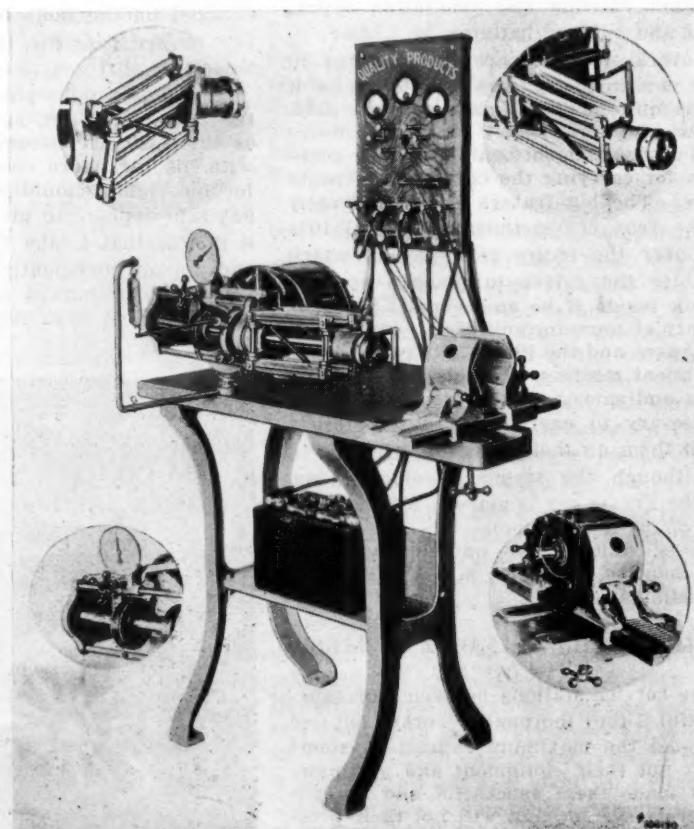
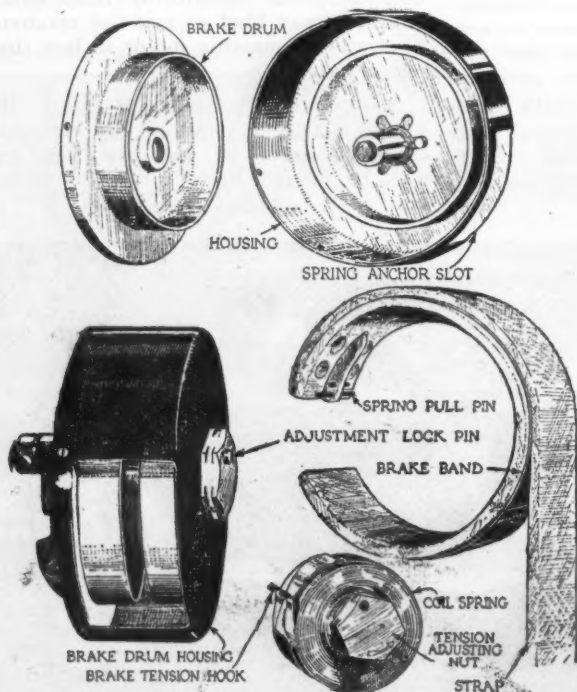
Due to the length of the coil spring, no flexure of the spring leaves is so rapid that the movement of the brake band cannot keep pace with it. The result is that the shock absorber is ready to function on the instant that the spring tends to return to normal. Due to the

wrapping action of the brake band around the drum, which increases with the amount of spring flexure, the action of the shock absorber is practically proportional to the action of the spring leaves. The tension of the internal coil spring is adjustable by turning a nut on the outside of the housing, thus winding the spring more tightly, or releasing it to some extent. All of the parts are given a Parker rustproof finish and the brake band material is of special quality designed to endure the life of the car.

BRIGHT COLORS FEATURE NEW DAVIS MODELS

The George W. Davis Motor Car Co., Richmond, Ind., has announced its 1922 models which are now in production. There are seven models, two roadsters, two four-passenger sport cars, a touring car, a coupe and sedan. Body lines are low. Brilliant new color combinations set off with striping make the new models distinctive. The chassis is unchanged. The color options on the open car are deep maroon, beaver brown and "Blue Devil" blue with striping in harmonious colors and gold. The coupe is finished in "Blue Devil" blue and the sedan in midnight blue. The open models have nickel plated luggage rods on the rear body panels. The sport models have aluminum military steps and individual fenders. On the open models the spare tire is carried on the right side just back of the front fender.

The prices for the 1922 models are as follows: touring car \$1895, sport car and roadster \$1995, Fleetaway four-passenger sport car and Man o' War, special sport roadster, \$2150, sedan and coupe \$2795.



On the left is shown various details of the Watson Stabilator, while on the right is shown a general view and several close-ups of the new T. D. No. 4 Universal test bench

Practical Tire Merchandising and Repairing

by Stanley P. McMinno



The Service Car and Its Equipment

A Movable Service Station Truck Should Be Big Enough Best Type of Body

THE service car is a necessary adjunct to a successful tire business, particularly if the business has to do to any considerable extent with truck tires.

But whether the business is entirely devoted to passenger car tires or is a combination of passenger and truck tires, customers expect that the company's equipment will include a service car, and this equipment can very easily be made into a money-making feature.

In addition to giving road service, the car can also be used for picking up repair work that may have been solicited by the salesmen. Promises are worth very little in the tire business. If a repair job is promised, the surest way of getting that job is to send the service car out for it immediately; otherwise it is very likely never to materialize.

The service car gives the concern a further argument in support of the contention that it is doing a real business. It is not necessary for customers to send their cars or trucks to your service station for tire service, as service may be taken direct to the customer.

A MOVABLE SERVICE STATION

This is a particularly valuable feature where trucks are concerned. Frequently the truck owner will find it impossible to send his truck to the service station during the day and inasmuch as his drivers cease work at five o'clock he cannot easily send it at night. Therefore, the concern will have a powerful sales lever if it is in a position to send the service car to his place of business, take the wheels or tires off his vehicles, put them in condition, and return them so that the car or truck can be ready for service the next morning.

If the business is devoted entirely to passenger car tires a very light service car will be satisfactory. But if truck tires are handled it will be necessary to have a vehicle large enough to handle at least one pair of heavy rear truck wheels together with their tires, and on occasion it may be necessary to carry two pairs.

TRUCK SHOULD BE BIG ENOUGH

Inasmuch as a pair of heavy truck wheels will weigh in the neighborhood of 1,500 to 1,800 lbs., it can be seen that as valuable as a Ford may be for other service, it is hardly of sufficient capacity for such work.

Maximum Service—Minimum Time

WHEN a passenger car owner drives up to your door he wants attention—to be looked after—his tires changed and inflated.

Therefore, your men must be trained to give the maximum service in the minimum time. They must not leave the job to go search for tools. They must take the tools with them.

This is vitally important in the case of commercial car owners, for every minute that the car is off the road it is losing money for its owner.

Service must be something more than snappy when a truck comes in. Tools in place, plenty of air pressure for tires, men up on their toes, and a smile, no matter what the trouble—these are the things a service station must have.

It should be remembered that in addition to carrying tires, rims, wheels, etc., it will be necessary to carry heavy jacks, tire tools and very likely some means of inflating tires such as a power-driven pump or perhaps an air bottle. Therefore, the service car for all around use should be of at least one-ton capacity.

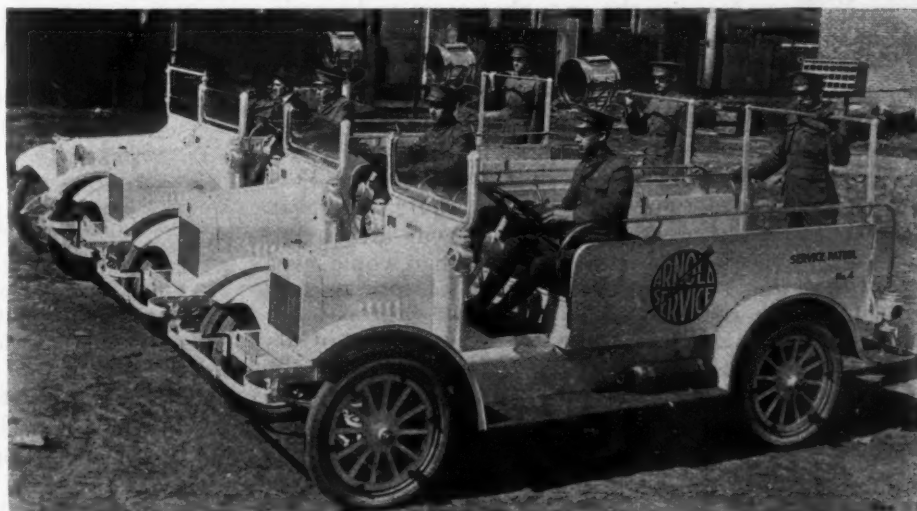
The type of body is immaterial as long as it is not such that it interferes with the work and that there is sufficient space to hold the necessary equipment and still leave room for tires, rims, wheels, etc.

BEST TYPE OF BODY

Panel bodies are excellent because they provide the maximum space for advertising signs; however, these are not suitable where a crane is used for hoisting truck wheels. Another advantage of the panel body is that in bad weather all the various equipment is fully housed and protected. Furthermore, it is a simple matter to lock such a body, thus preventing loss or theft of tools and equipment.

Perhaps the best all around type of body is one patterned fairly closely after the partly uncovered police-patrol with a large step at the back and hand-rails. It is a simple matter to mount a serviceable crane on such a body and there will be plenty of room to store equipment and to handle a couple of pairs of truck tires as well as other tires.

Regardless of the type of body there should be a series of compartments for all of the necessary pieces of road equipment. Jacks will be put in one place, tire irons in another, rim wrenches, etc., in another.



Perhaps the best all around type of body has been patterned very closely after the police patrol, with a large step at the back and a hand rail. The searchlight is a valuable adjunct if night service is given



EDITORIAL



A National Nuisance

MAN'S mental processes are, after all, an odd conglomeration of inconsistencies. Thousands of years were required to find out that it was not necessary to contort oneself into a stiff bosomed shirt from the bottom, working havoc to a carefully prepared coiffure—this, despite the fact that coats had been built on sane lines since Adam discovered the desirability of cloaking his form from the gaze of the disciplinary angel.

A parallel state of mentation is keeping the master minds of state legislatures in a turmoil devising "thou shalt" and "thou shalt not" to govern automobile illumination, resulting in the cluttering up of the state codes with a mass of legislation which utterly fails to remedy the fault aimed at, namely, the dangerous glaring of automobile headlamps.

One legislature rules that light rays shall not shine above a certain level at a certain distance in front of the car while another expresses the opinion that another height and distance are about right. A third favors one make of non-glaring lens while a fourth says, in effect, "You're all wrong" and leaves it up to the local city, village, county and township solons to add their mite to the hodge podge. And all this time the wrecking of cars and the killing and maiming of blinded motorists goes merrily on.

Instructive matter, covering the focusing and adjusting of headlamps has been scattered broadcast by lamp and car manufacturers, no two of whom agree, by the way. The results are wierd, spectacular, varied and would be comical were they not tragic in altogether too many instances. For who has not, while out for an evening's drive, been confronted with cross-eyed, cock-eyed, bleary-eyed, inebriated and soulful lamps? These last are the ones that seem to be seeking to express the owner's spiritual aspirations by an upward cast beam which searches the heavens at most any angle from fifteen to ninety degrees.

Reverting to the introductory thought—why high-candle-power bulbs in the head lamps at all when the all-searching spotlight is pointing the way to a sane solution of the difficulty? Who is there who has ever used a "spot" to watch the dangerous ditch edge or pick out the wayside trail markers that would ever do without one? Placed at a height of four or five feet above the roadway and directed at a downward and right hand angle of thirty to forty degrees it affords the ideal illumination and, unless carelessly manipulated or deliberately used to do so, cannot possibly blind other wayfarers.

Another fact which points the way towards the ultimate passing of the brilliant headlamp bulb, except as an ornament of questionable taste, is that the lights of most spotlight equipped cars are becoming dimmer, the owners replacing the large bulbs, when they burn out, with others of lower candlepower. It

is, perhaps, too much to hope that all cars will be equipped with spotlights this or next season, but ultimately, what is now looked upon as a handy accessory will be considered as necessary as the steering wheel, and those who insist upon dazzling their brethren with the optically, white-hot ray from nitrogen bulbs and parabolic reflectors will be an anathema throughout the length and breadth of the land.



Smaller Engines and Lighter Cars

SINCE it has been announced that the 1923 Indianapolis 500-mile race would be restricted to cars with engines of 122 cu. in. piston displacement, numerous inquiries have been made as to the likelihood of its being reflected in the design of our cars of the future. In answer to this we can only say that some of the ideas and practices gleaned from the use of small engines may be incorporated in cars of the future, while others will be only useful, perhaps, in cars designed and built for racing.

Small engines and light cars are popular in Europe, but have not met with much favor in this country. Perhaps the roads here have much to do with the case. Then, too, the European does not mind changing gear often, a procedure necessary with small cars and engines. In this country we are wont to take every hill on top gear. If we cannot do it, we haven't a real car—at least, that is the way the motoring public feels about it, and it is the motoring public that must be satisfied.

Small engines must be run very fast to get efficiency out of them and this again means the most careful design and workmanship. The parts are lighter and must be made of the best materials. The small car must be made to compete with the larger and more ruggedly built car produced in quantity and at a lower price. Many designers prefer the larger engine running at a slower speed to the small high-speed engine, because they state the frictional losses are not so great in the former.



Help the Pueblo Dealers

SUPPOSE your business had been swept away by the recent flood of the Arkansas River, as was the case with that of a good many automotive dealers of Pueblo, Colo. Of course, you are thankful it did not happen to you, but what of those dealers in Pueblo whose water-swept buildings were left in a state of chaos? Their business is gone, financially and literally. A short time ago the Automotive Equipment Association raised \$17,000 for one of these stricken dealers. Now the N. A. D. A. is getting in its good work by getting together a fund for Pueblo. You can give what you like, but in giving, remember "what if it had happened to you?"

Appleby Bill Provides Special Tax on Cars and Federal Licenses for Drivers

Measure Offers Reciprocity of Licenses Between All States with 90 Per Cent of Revenue Derived Going to Federal Government Rate 40 Cents Per Hp.

WASHINGTON, Aug. 1—Congressman Appleby, of New Jersey, has introduced a bill providing for a special license tax on automobiles and for a Federal license tax for motorists. The broad principle of his bill is in line with the proposal of the Treasury Department that a Federal license tax should be imposed as a part of the internal revenue bill. A reciprocal feature would carry out the principles for which the National Automobile Chamber of Commerce and the American Automobile Assn. and other automobile organizations have sought, in a legislative manner.

In an interview with MOTOR AGE, Congressman Appleby today said that he had not estimated the probable revenue that would accrue from the license tax. He appeared before the House committee on ways and means and explained his bill. Ninety per cent of the revenue derived from the licenses go to the Federal government and 10 per cent to the state.

Registration Tags Interchangeable

The rate as proposed by the Appleby bill would be 40 cents per hp. or a fraction thereof in the case of all vehicles having pneumatic tires, with a minimum charge of \$5 for any motor vehicle. For each motor vehicle equipped with solid tires and having a rated carrying capacity of not more than one ton, \$10, and \$10 for each additional ton up to 7 tons, when the Federal rate would be \$70. Motorcycles would be obliged to pay \$3 per year, with an additional tax of \$1.50 for each sidecar. Manufacturers of or dealers in motor vehicles other than motorcycles would be obliged to pay \$3 for each registration tag, and registration tags would be interchangeable among the cars owned or used by such manufacturers or dealers during the current year for which the tax is issued, and would be allowed to be used only on new vehicles being brought under their own power from a factory to a dealer.

It is further provided that "No such dealers' tags shall be used on any car employed in transportation for hire or livery business. For each registration tax issued a dealer in motorcycles, \$1.50, such tags to be interchangeable as in case of dealers in other motor vehicles. For each rubber-tired vehicle with a carrying capacity of one ton or less,

New Appleby Law Provisions

NINETY per cent of the revenue derived from the proposed law will go to the Federal government and 10 per cent to the state.

The rate proposed in the bill will be 40 cents per hp. or fraction thereof in cases where vehicles have pneumatic tires, with a minimum charge of \$5 for any vehicle. For each motor vehicle having solid tires and a rated capacity of not more than one ton, \$10 will be charged, and \$10 for each additional ton up to seven tons, when the Federal rate will be \$70.

Motorcycles will be forced to pay \$3 a year, with an additional tax of \$1.50 for each side car.

Manufacturers and dealers in motor vehicles other than motorcycles will be obliged to pay \$3 for each registration tag.

trailed or propelled by any motor vehicle on which a Federal license is required to be displayed, \$5, and \$5 additional for each additional ton of carrying capacity or fraction thereof."

It is significant to note that the Appleby bill provides that the charges which it prescribes shall be for the 12 months period "and shall in no way conflict or interfere with the license fees imposed by the respective states."

Federal Licenses for Drivers

The administration of this proposed act would be vested in the Bureau of Public Roads, after authority had been conferred upon it to negotiate with motor commissioners of the various states. The penalizing provisions of the bill call for a fine of not less than \$50 nor more than \$300 when any person operates an automobile without a Federal license. A Federal license is not obtainable until the state authorities have been convinced that the applicant for a license is qualified to operate a motor vehicle upon a public highway.

Section 2 of the Appleby bill would

authorize the reciprocity of licenses between all states. A measure of a similar nature is now pending before Congress and is known as the Pittman-Sweet bill. The Federal registration tax would be affixed and would form a part of the state license tax, which tax could be recognized by the authorities of the several states as permitting the owner of the automobile to whom the license was issued to operate the machine within the confines of any state he may be visiting, or through which he may be passing, without any additional registration or the securing of any other license or tax or the payment of any additional tax.

Congressman Appleby also proposed a plan to the House Committee on Ways and Means to impose a stamp tax which would yield approximately \$45,000,000.

VACATIONS PERIL TOWNSEND BILL

Washington, Aug. 1—With several congressional leaders pressing for a six weeks' recess, advocates of highway legislation are working industriously in an effort to obtain action on the Townsend bill in the Senate before the recess. It is understood that the Senate Committee on Postoffices and Postroads will shortly report a bill containing distinctive features of the Townsend measure and certain compromised provisions of the Dowell bill which recently passed the House.

Highway legislation has been an impasse because one farm organization insisted on the continuation of Federal aid despite the recommendations of the President to the contrary. Senator Townsend, Chairman of the Senate Committee, is determined that the distribution of Federal highway funds must be changed and for that reason has fought to preserve the fundamentals of his bill, which was reported out of the Senate Post-office Committee several weeks ago.

GOVERNMENT NOT SELLING CARS

Washington, July 29—Official denial is made to reports that the War Department had changed its policy of selling surplus motor vehicles by offering for sale in blocks of ten Ford runabouts and touring cars at nominal figures. The statement that trucks and touring cars are being sold to men in the service and ex-service men at reduced prices and that trucks are being leased for \$100 a year, were branded as erroneous by director of sales.

Famous Magnates Grace Rickenbacker Motor Co.

Men Who Lent Throb to Early Industry Associate Themselves with America's Premier Ace

DETROIT, Aug. 1—Backed by Walter Flanders and B. F. Everit, Capt. E. V. Rickenbacker, America's Ace of Aces, is about to enter the ranks of American motor car manufacturers. Application has been filed at Lansing for a charter for the Rickenbacker Motor Co., a \$5,000,000 concern of unusual strength and resources, backed by a group of automobile magnates. The filing of the application papers answers a question which has been in the mind of motordom for two years. Everyone has been asking what Rickenbacker was going to do and the same question has been asked regarding Walter Flanders, who, when he turned over the Maxwell organization, announced that he was going to retire.

Were Members of E. M. F. Concern

This is not the first time that Flanders and Everit have been associated as they were two members of the old E. M. F. group, which later became the Studebaker corporation. The only name that is missing is that of William E. Metzger, who was the M. in the combination. This organization looms large in the history of automobile manufacturing activity as one of the first to manufacture a low priced car in large quantities.

Since the sale of the E. M. F. concern to Wall Street interests, Everit has confined his attention entirely to his original business of automobile body building and is today the second largest body builder in the world.

The name of Flanders is familiar to the youngest member of the automotive industry. He took over the defunct United Motor Co., from which he created the Maxwell Motor Co., of which he was the head from 1911 to 1920. During that time this organization earned \$18,000,000 in profits, having started from what was known as a pile of scrap. Mr. Flanders has continued to insist up to this time that he was going to remain in retirement and, in fact, made this announcement in Detroit not more than 10 days ago.

However, those well informed in the industry always believed that Flanders would come back. Rickenbacker stated today that the design of this car was started over two years ago when he returned from Europe determined to enter the automobile manufacturing business. He states that the design of the car incorporates many points learned during his racing and aviation experience and is combined with sound manufacturing points learned through his own experience in the automobile field and that of his associates.

As it now stands, the organization includes B. F. Everit, president and general manager; E. V. Rickenbacker, vice-

president and sales director; Harry L. Cunningham, secretary and treasurer; Walter E. Flanders, Carl Tichenor, Roy Hood and E. R. Evans, directors.

Cunningham is one of the oldest men in the automobile industry and has been associated with Everit and Flanders virtually since the beginning of the business. Cunningham helped Alexander Winton build his first car and was chief assistant to Henry Ford when he built the old 999. He has been Ford branch manager in Detroit and continued as assistant engineer until the E. M. F. organization was started when he joined this group. His last position was that of sales engineer in charge of production at the Maxwell-Chalmers company. Since Flanders left Maxwell-Chalmers, Cunningham has been devoting his entire attention to perfecting the Rickenbacker car.

Roy Hood has had a similar history. He has been noted as a purchasing agent in the automobile field and started as assistant purchasing agent of the E. M. F. group. He later held the same position with the Studebaker corporation and then became purchasing agent of Maxwell-Chalmers. His position in the new concern will be that of purchasing agent.

Carl Tichenor is known as a production man and during the war played a large part in Liberty motor production. During the last two years he has been production manager of the Pierce Motor Car Co., Buffalo.

Rickenbacker has stated that he cannot give details of the car at present, but that it will be a popular priced, large production model.

Compare N. A. C. C. Production Figures Before You Say—

NEW YORK, July 31—Production of passenger cars by the automobile manufacturers who are members of the National Automobile Chamber of Commerce for the second quarter of 1921 was 57 per cent of the production by the same companies for the second quarter of 1920.

Ford production for the second quarter this year was 137 per cent of the same quarter last year.

Production for the industry as a whole in the second quarter of 1921 was 87 per cent of 1920, and that by the N. A. C. C. companies for April, May and June was 107 per cent greater than for January, February and March.

Production by truck companies which are members of the N. A. C. C. for the second quarter this year was 39 per cent of the second quarter of 1920. It was 34 per cent greater than for the first quarter this year.

WINS FIRESTONE SCHOLARSHIP

Tacoma, July 29—Frank H. Gloyd, senior in the local high school, has been declared state winner of the Harvey S. Firestone scholarship prize for his essay on "Good Roads and Highway Transportation."

Ford's Financial Magic Makes Piker of Aladdin

Story of Difficulties Overcome, Cutting of Costs and Sums Involved Pales Arabian Nights

DETROIT, Aug. 1—Details of the manner in which Henry Ford overcame the financial difficulties which confronted him early in the year and escaped from the bankers who were waiting eagerly to get a share in his business by means of a loan, have been printed at length recently in the daily newspapers. The salient facts were recounted in MOTOR AGE some two months ago.

Early in January Ford needed \$58,000,000, \$33,000,000 for bank loans, which he made to buy the holdings of the Dodge brothers, \$18,000,000 for Federal taxes, and \$7,000,000 for employees' bonus.

He had on hand \$20,000,000 in cash and raised \$24,700,000 by the sale of cars manufactured from parts on hand in the main factory and the assembling plants. He collected \$3,000,000 due on foreign accounts and realized \$7,900,000 by the sale of liberty bonds. Another \$3,700,000 came from the sale of coke and by-products. This left a margin of \$1,300,000 for operating expenses.

The additional funds needed were obtained by making use of the Detroit, Toledo & Ironton Railroad. Before he got control of the road it took an average of 22 days to haul raw materials to the factories, work it up, and get it to dealers. The money tied up in this way was constantly about \$88,000,000. This time was reduced to 14 days and the amount tied up reduced to \$60,000,000. This left \$28,000,000 for operating capital.

The most striking feature of the story is the sharp reductions which were made in manufacturing costs. All non-essential jobs were abolished. Late in 1920 the average cost of labor and commercial overhead per car, exclusive of material, was \$146. Now it has been cut to \$93. Formerly 15 men were required per day per car. Now it requires only nine.

ALLIED TRADES IN MEMBERSHIP

Columbus, O., July 29—The Columbus Automobile Trade Assn., at a recent meeting, adopted a new constitution and by-laws, made necessary because of the exigencies of the situation. Under the former constitution tire dealers as well as garagemen were not permitted to become members. Under the new plan, all allied industries are admitted to associate membership. This includes tire dealers and tire repairmen, garagemen, proprietors of repairshops and service concerns. Under the new constitution there are various divisions, such as passenger car, truck, tire and accessory dealers and service concerns.

Wisconsin's New Road Law Limits Loads on Highways

State Thoroughfares Are Classified to Carry 7 and 12 Tons, Respectively

MILWAUKEE, Aug. 1—Probably the most important change in the state laws of Wisconsin affecting the use of motor vehicles, known as the state motor code, is a new provision classifying highways according to load of truck and trailer. It was enacted at the biennial session of the legislature, just ended, at the request of the State Highway Commission, which regards it as necessary to protect the system of trunk highways now being built.

The provision reads in part as follows:

"Commencing Jan. 1, 1922, the highways of Wisconsin, maintained by the state or its counties, insofar as the limitation upon the use of motor vehicles, trailer, or semi-trailers, upon said highways is concerned, are divided into the following classes:

"(a) Class A highways shall include those highways upon which may be used any motor vehicle, trailer or semi-trailer weighing with its load not more than 12 tons.

"(b) Class B highways shall include those highways upon which may be used any motor vehicle, trailer, or semi-trailer, weighing with its load not more than seven tons.

"The class into which any section of highway shall fall shall be determined by the state highway commission, if said section forms a portion of the maintained state trunk highway system; by the county state road and bridge committee, if said section is a highway, not a state trunk highway, maintained by a county."

State Will Issue a Map

As soon as the classifications are made, the state will issue a map for the guidance of owners and drivers of vehicles. Police officers are authorized to demand drivers to take their vehicles to the nearest public scale in case of doubt as to the weight of the load. The law also requires:

"On and after Jan. 1, 1922, no motor truck, motor delivery wagon, passenger automobile bus, or trailer or semi-trailer hauled by or used in connection therewith, shall be operated by any person upon any highway of Wisconsin, unless the motor vehicle, trailer, or semi-trailer shall have attached to or lettered upon each side thereof, a sign giving its weight without load, the actual advertised load carrying capacity of such vehicle, and the total weight of the vehicle and load, the last named being the total of the two above weights. Said weights are to be given in short tons and nearest quarter-fractions thereof. The load carrying capacity indicated on any such motor vehicle shall, in no case, exceed the load carrying capacity of such vehicle or trailer as advertised or established by the manufacturer thereof."

Any city of the first, second or third class may permit trucks weighing with their loads more than 12 tons, upon Class A highways within their limit, and wholly maintained by said cities. Provision is made also for suspension of the requirements in emergencies, for specific purposes and temporary needs only, as well as for limitations of loads below the

stated requirements for good cause and in the public interest.

A change was made in verbiage throughout the state motor code, so that where the simple words, "automobile, motorcycle or other similar motor vehicle" occurred, the following expression is substituted: "Automobile, motor truck, motor delivery wagon, passenger automobile bus, motorcycle or other similar motor vehicle." The speed limits have been made somewhat more liberal than before, although the maximum in cities is left at 15 m.p.h., and in the country at 30 m.p.h.

Were Easy to Buy; Hard to Pay

INDIANAPOLIS, Aug. 1—Virtually all the liability listed by the B. L. Wallace Amusement Co., Kokomo, in a voluntary petition in bankruptcy filed in the federal court here, consists of notes for motor trucks in transporting the circus. The liabilities were placed at \$14,163.31 and its assets at \$5,891.

70 Are Indicted in Alleged Fraud in Tire Stock Sale

New York, July 31—Nearly 70 alleged representatives of the American Tire Corp. of Niles, O., have been indicted in the Federal courts on charges of using the mails to defraud. They are located in this city, Syracuse, Buffalo, Boston, Springfield, Mass., New Haven and Providence. Most of them represent the brokerage firm of Durell Gregory & Co., of this city, the members of which also have been indicted.

The American Tire Corp., a bona fide concern incorporated in Delaware with a capital of \$5,500,000 is not involved in the charges, but it is charged that investors throughout the country have lost more than \$1,000,000 through the operations of the men accused. Development of a new process of tire manufacture is said to have necessitated an increase in capital and officers of the company came here to float an issue of \$1,000,000. According to the indictment the brokers agreed to return to the company \$2 for every share sold, and then sold the stock for as much as \$10 a share.

NEW PRICES ON REO

Lansing, Aug. 1—New prices have gone into effect on the Reo touring car and roadster, and a new series of sedan and coupe has been brought out to supersede the present type. The new prices for the touring car and roadster are \$1,650 as compared with \$1,850. The new sedan, known as Series B, will sell for \$2,750, and Series B coupe for \$2,700. No mechanical changes of any note have been made, but the bodies on the new sedan and coupe are entirely new.

Farm Bureau Federation Fights Ohio Road-building

Makes Claim That Costs Are Excessive and That Repairs Only Should Be Made

COLUMBUS, Aug. 1—The Ohio Farm Bureau Federation makes the statement that a large majority of the county organizations in the Buckeye state believe it unwise to continue to build expensive roads under present conditions and that the time and money of the Ohio highway department should be used for repair and maintenance of existing improved highways. In reply to questionnaires sent out to 80 county organizations, all but one favors a pause in new work during the present period of high construction costs. This is the statement of C. A. Dyer, legislative agent for the Ohio Farm Bureau Federation.

Authorities of Marion county have started a determined effort to prevent road building in that county at high prices and to that end County Prosecutor Fred Warner has filed a formal protest with Ohio Highway Commissioner Leck C. Herrick.

Senator Brand of Champaign county, is another advocate of the let-up in road building under present conditions, charging that costs are excessive and that the program should be delayed until costs become more reasonable. He has become involved in a controversy with Highway Commissioner Herrick on the question. Commissioner Herrick believes that the road improvement program should be carried out as planned.

SELLING SPACE FOR HOOSIER SHOW

Indianapolis, July 29—Applications for space for the Indianapolis Automobile Show have been sent out to members of the Indianapolis Automobile Trade Assn. by John Orman, secretary of the organization. Mr. Orman has been waiting for the floor plans before sending out space applications. The show is to be held the week of Sept. 5 in conjunction with the state fair. It is felt by officials of the association that as much space will be requisitioned as for the spring show and probably more.

SEIBERLING BACK IN RUBBER

Newcastle, Pa., July 31—Frank A. Seiberling, former president of the Good-year Tire & Rubber Co., has "come back" to the rubber industry, as his friends predicted he would.

Under a court decree he will take possession of the New Castle Rubber Co. which he purchased for \$103,000 at a bankruptcy sale some time ago. This price was considered very low as the factory is well equipped and cost several times that amount. While awaiting confirmation of the sale by the court, Seiberling told New Castle bankers that he expected to take personal charge and begin operations as soon as possible.

Automobiles Seem Doomed To Bear Federal License

Elimination of Excise Taxes on Cars is Not Encouraging at This Time

WASHINGTON, Aug. 1—Outlook for elimination of excise taxes on automobiles is not particularly encouraging at this time when the House Committee on Ways and Means is framing a new revenue bill. The treasury will recommend the abolition of the excess profits tax, reduction of transportation tax and other reduction in surtaxes, elimination of the so-called, "nuisance" taxes and other minor changes. The President has been advised that the House will enact the tax bill by August 6, but House leaders say it will be fortunate if the bill is reported out of committee by August 15. Indications are that the Federal automobile license tax will be reported by the House Ways and Means Committee.

The U. S. Chamber of Commerce advised the Ways and Means Committee that a canvass of business throughout the country showed that the second largest vote on taxation matters was for the repeal of the war excise taxes, ranging from automobiles and the accessories to wearing apparel.

The sales tax which the National Automobile Chamber of Commerce had endorsed has been definitely shelved by the House Committee on Ways and Means. As there will be no need for extra funds to meet a soldiers' bonus, the sales tax will not be necessary, though Congress must devise methods of raising \$4,000,000,000.

May Accept Program

It is known that the Ways and Means Committee is likely to accept the program of tax revision as submitted by the treasury because it affords the easiest way out of a difficult situation. The House committee will undoubtedly amend the treasury plans, but the belief exists that the recommendations of the administration will be given as the views of the committee. The Senate Finance Committee conducted extensive hearings on the sales tax last spring.

Serious thought has been given to the proposal to make the internal revenue laws retroactive over the calendar year of 1921 on taxes such as income, which are based on the calendar year. Other forms of taxes would be effective immediately after the tax bill is signed by the President if Chairman Fordney, of the House Committee has his way. The treasury will recommend the abolition of the excess profits tax because it is iniquitous and a failure from the standpoint of additional revenue. It is proposed to substitute an increase in corporation income taxes from 10 to 15 per cent with the repeal of the \$2,000 exemptions for corporations. It is barely possible that it will be necessary to

raise the percentage of 16 per cent on undistributed profits of corporations.

The treasury will recommend a reduction of the higher surtaxes to about 40 per cent and it is believed that the Ways and Means committee will accede to this request. Treasury officials insist that the condition of the treasury will not permit a reduction of the tax rate on individual incomes. The fact that the average earnings of citizens have fallen considerably during the last year is something that tax experts have considered.

Price Reductions Average 14.8 Per Cent

CHICAGO, Aug. 1—About 30 per cent of the cars selling above \$4,000 have announced reductions. Measured in percentages the reductions range from 5 per cent to 34 per cent, the average decrease made by the companies which have reduced prices being 14.8 per cent.

With more than 2,000,000 workers out of employment for varying periods, it is reasonable to believe that the yield of this form of taxation will not reach the proportions of last year.

New modes of taxation have been studied by treasury tax experts. The closest attention has been given to their possible yield and the effect upon business. The actuary of the treasury has estimated that the Fordney tariff bill will yield about \$450,000 annually, or an increase of \$150,000 over the Underwood law. This figure may shrink if the Senate decides that the rates proposed by the House are excessive. Money must be raised in a hurry to meet governmental obligations. The treasury believes it possible to enforce a Federal automobile license which would be paid directly by the consumer or the user. In addition, they have suggested a tax on bank checks. Business men have made clear the fact that conditions have changed and industry is no longer in condition to be taxed indiscriminately.

SHERMAN ENTERS NEW FIELD

New York, Aug. 1—The staff of the Class Journal Co. gave a farewell luncheon to Ray W. Sherman, executive editor, who has resigned to become merchandising director of the Automotive Equipment Assn. Sherman was presented with a handsome watch as a mark of esteem.

David Beecroft, directing editor of the Class Journal publications, presided. He praised highly the work done by Sherman in building up Motor World, with which he was connected for more than seven years. An address of similar purport was made by H. M. Swetland, president of the United Publishers' Corp., and the Class Journal Co.

The presentation of the watch was made by Neal G. Adair, editor of Motor World.

Mr. Sherman is now in Chicago and will take up his new work immediately.

Steady Improvement In Tire Market Is Noted At Akron

Small Factories Keeping Apace With Increased Production—Good- year Declares Dividend

AKRON, O., Aug. 1—The tire industry insofar as Akron's factories are concerned, continues on a fundamentally sound basis, with optimism prevalent among all manufacturers. This is indicated by reports of tire manufacturers here this week, of steadily increasing dealers' orders, and of heavy increases in original equipment tire specifications from automobile manufacturers.

The outstanding happening of the week in the tire industry in Akron was the Goodrich action in declaring the regular quarterly dividend on preferred stock, of one and three-quarters per cent, and announcement that the company through liquidation of its inventories, had reduced its bank indebtedness since Jan. 1, approximately 50 per cent, or from \$29,000,000 to \$14,900,000. The Goodrich dividend is payable Oct. 1 to stock of record Sept. 21.

Goodrich officials say that although their sales for the first four months of this year were far from satisfactory, a noted improvement in business has been experienced since May 1. It is predicted officially that with present sales continuing Goodrich will be able to entirely reduce its bank indebtedness by the end of the current year. Goodrich is now on a basis of about 16,000 tires daily.

Survey Shows Increase In Industry

A survey of the automobile industry conducted by research experts of the Firestone Tire & Rubber Co., shows that automobile production now is running about 61 per cent of last year's peak production. Firestone furnishes original equipment for 47 automobile manufacturers in the United States, and reports all original equipment specifications heavily increased since May 1.

Firestone's production ticket is 23,000 casings and 25,000 tubes daily. Good-year's production ticket is 25,140 casings and 30,000 tubes daily in the Akron factories, and 3,500 tires at California, giving the company a production averaging over 90 per cent of peak production of 31,181 tires daily, obtained in the spring of 1920.

Smaller Akron factories are keeping apace with the larger tire building corporations in respect to production increases, and are gradually adding more men.

Virtually all tire factories have completed their salary and office personnel and wage readjustments and have liquidated their inventories. Many are following the Goodyear lead of placing the entire office and factory on a budget basis, with every department assigned a given budget for the year and told to keep within that budget.

Start State-Wide Drive to Boost Townsend Bill

**Indiana Automotive Trade Assn. Is
Active in Campaign to Popular-
ize Highway Measure**

INDIANAPOLIS, July 29—The Indiana Automotive Trade Assn. is preparing to launch an active campaign throughout the state in favor of the immediate passage of the Townsend highway bill now in Congress. One of the first acts of this campaign will be to endeavor to make the Indiana state highway commission see the bill in a favorable light. Officials of the association have made arrangements to talk over the situation with the state highway commission, which up to the present time has been opposed to the bill. Members of the commission are said to have been extremely active in their opposition and also to have written to the Indiana delegation in Congress voicing their views.

The state commission is opposing the bill under the impression that only hard surface roads will be subjected to Federal aid under the provision of the bill. Officials of the Indiana Automotive Trade Assn. say that the wording of the bill is such that any road, gravel, dirt, or crushed rock may be given Federal aid, provided that the material selected is the best for the future use of the road. The automobile association agrees with the highway commission in that connecting roads in the state between the main state highways should not be hard surfaced; but the organizations have construed the congressional bill to mean two different things.

NEW STANDARD IN BUYING

San Francisco, July 28—The automotive sales market on the Pacific coast has passed from a price stage to a value stage, in the opinion of Harry A. Weihe, general sales manager of the Pacific Nash Motor Co., of this city.

"For a number of months the public has been basing its judgment in car purchasing on the price," said Weihe, "but now, however, the true standard—that of quality—is being used by virtually all prospective buyers of automotive vehicles, whether they be passenger cars, trucks or tractors. The majority of cars have returned virtually to pre-war prices and this has put the people on a standard of values rather than costs. Recent price reductions have stimulated buying to a great extent, but the people are looking for values today, even more than they are for reductions in prices.

NO SLUMP IN JULY TRADE

Indianapolis, July 28—As July nears an end, it is evident here that the volume of business will exceed that done in June by a larger per cent than was expected. The greatest increase can be noticed by those automobile companies who have just recently made reductions in prices. The increase at the Cole plant has been

noticeable. Since the reduction in prices, orders received at the plant show an increase over the pre-reduction period of approximately 45 per cent. Other plants are able to show increases of from 20 to 30 per cent. Those companies who made reductions earlier in the year are having a steady business, tending, officials say, toward a slight increase. These companies obtained increases immediately after prices were reduced and, contrary to all predictions here, their sales did not slump after the first increase.

Wouldn't Share the Road—Fine!

SHELBYVILLE, O., July 30—*Charged with "hogging the road" in Shelby county a few weeks ago, Layman Norris, Milford, Ind., was fined \$60 and costs in circuit court after trial in which witnesses testified that Norris would not give way to a passing motor vehicle, causing an accident.*

WINS ROAD-BLAZING TROPHY

San Francisco, July 29—The Yosemite Lodge Perpetual Challenge Trophy was presented this year to R. F. Thompson, manager of the Howard Automobile Co., whose Buick was the first car to reach Yosemite Valley after the roads were officially declared open. This trophy is a handsome bronze plaque, a perpetual challenge award, and is given to the car that travels over the roads of the high Sierras, reaching the Yosemite Valley ahead of all other competitors after the winter season is over.

No stunt or trick running is recognized, but once started, the car is expected to keep on going. This year's Buick, for instance, encountered wash-outs, fallen trees, boulders in the road, and, finally, a sudden thunder storm, but kept on going, with the result that it is the first to have its name on the plaque.

1,000-Mile Reno Desert Race to Be Made Annual Affair

San Francisco, July 31—The Nevada Highway Assn. has decided to make the 1000-mile road race held this year an annual event, according to advices by automobile dealers in this city. To this end, prizes are being arranged of sufficient size to make this a classic and to attract the foremost drivers of the country to the desert grind every summer. The association is offering a first prize of \$5,000 for the 1922 race, with second prize of \$1,500, and third money of \$1,000. Besides the cash prizes, valuable cups, sets of silver, and other trophies will be offered. Negotiations have been entered into with the American Automobile Association, to have it supervise the next race. Headquarters of the Nevada association are at Reno, which is the starting point, and, likewise, the finish of the 1000-mile race.

July Sales in Cleveland Hold High Mark of June

**Dodge Predicts 250 Deliveries Per
Month During Remainder of
Year**

CLEVELAND, July 30—The Barnes Motor Co., Dodge agency, delivered in June a total of 296 cars in Cleveland. Up to the twenty-third day it had delivered 215 cars in July, and F. E. Richardson, sales manager and secretary of the Barnes Motor Co., says that July business will equal the sales for June.

"We will deliver an average of 250 cars a month the remainder of the year," said Richardson. "One can only realize what this means by comparing our sales in previous years. The best month in the history of the Dodge agency prior to June this year saw but 110 cars delivered. The month of July this year is 100 per cent better than any July ever experienced by the company.

"Here again the great influence that price has on sales is amply shown. Before the recent reduction in Dodge prices, business had been fairly good with the company, but it was nothing to brag about. Then came the lower prices, and the company looked forward to a short spurt in sales. The spurt came and is continuing right through the so-called dull season.

Excellent Prospects for Dealers

Richardson says the consumer is certain that the price of the Dodge car will not go lower, and he is now in the market for it as he never has been before. He sees excellent prospects for the average dealer in this city, as the automobile industry has been the first to get back to normal prices. There was a curtailment of buying—although the desire for new cars was as strong as ever—while the public awaited lower prices; now, as is the case after periods of slow buying, the volume will be greater, according to Richardson.

The Ohio-Buick Co., saw no slackening in sales during July, according to E. J. Leicht, retail sales manager.

Business the first seven months of this year has been about as good as it was in the same period a year ago, when everybody was talking about conditions in the trade being abnormal. It has become noised about the city that the Buick company is soon to put on the market a four-cylinder car, and the company is having many inquiries for it. A large sale of this model is anticipated.

The Chevrolet agency continues through the fourth week of July at about the same pace that was maintained the preceding three weeks of the month. The Maxwell agency, represented here by the Avenue Motor Co., reported July trade brisk.

The Hudson-Essex agency, the Carle-Franklin, the Nash and Templar agencies also report July business this year is above the average for the month in the past.

Anti-Theft Laws Occupy Conference at Detroit

**Underwriters and N. A. C. C. Heads
Discuss Measures to Prevent
Nation-wide Car Stealing**

DETROIT, July 31—Safety-first measures and the enactment and enforcement of country wide anti-theft laws were the subject of discussion by insurance and automobile executives representing the National Automobile Underwriters conference and the National Automobile Chamber of Commerce at a conference recently in Detroit.

Great interest was shown in the new Michigan law which is aimed to safeguard ownership and prevent unlawful sales. W. P. Young, secretary and general manager of the National Automobile Underwriters conference, stated that one of the causes contributing to the increasing theft of motor vehicles has been the inadequate penalties imposed generally through the country, and that public sentiment must be aroused to a more vigorous enforcement of all anti-theft statutes.

J. S. Marvin, assistant general manager, National Automobile Chamber of Commerce, stated that the conference was called at the request of the insurance executives to discuss the dissatisfaction that has been expressed by automobile manufacturers with the rising cost of insurance to the public and the mechanical details involved in the grouping of cars for insurance rating purposes. It was felt by those present that much good has been accomplished by a free discussion of the problem from both sides and a further meeting is planned after each interest has had time to consider the matter further. Reduction of thefts and accidents, however, seems to offer the best means of reducing insurance costs and every effort will be made to that end.

ROAMER CHANGES DEALERS

Philadelphia, July 28—The Roamer car hereafter will be handled by the Philadelphia-Roamer Co. for eastern Pennsylvania, southern New Jersey, Delaware and eastern Maryland. The organization is not a factory branch, but is closely affiliated with the factory, because A. C. Barley, president and principal owner of the Barley Motor Car Co., manufacturer of Roamer cars, is president and one of the principal owners of the Philadelphia organization.

BUYERS THREATEN CANCELLATION

Philadelphia, July 30—A canvass of eight suburban boroughs and towns, ending today, shows that while new automobiles are, in most instances, selling well—much better than a month ago, in fact—there is now danger of some of the sales being cancelled because of slowness of factory production. In not a few instances customers who have ordered

cars and found they could not be delivered for many weeks have stated their intention, in case of non-delivery within a specified time, to cancel the order and obtain a car of another make.

While the sale of accessories, with the exception of such articles as greases, windshield cleaner, and the like, is limited in most of the dealers' places, as well as garages, tire sales are beginning to increase, except in far-outlying points. Truck sales are slow and nothing much is being done in the line of trailers, although some tractors are being sold, particularly for industrial purposes.

Steal Recovered Car From Sheriff in Jail Yard

FORT WAYNE, Ind., July 28—

Something new in the way of an automobile theft recently took place here when thieves stole a Lexington car out of the yard at the jail. The car had just been recovered by the sheriff from a thief who had stolen the car from its owner. The car was finally recovered the second time in Kalamazoo.

Automotive Heads Take Over Fletcher Stock in Big Bank

Indianapolis, July 29—Five men prominent in automobile industrial circles of Indiana are in a group of stockholders which has acquired the interests of Stoughton A. Fletcher in the Fletcher American National bank, leading financial institution of this state, according to announcement by the bank, made public today. These men are Carl G. Fisher, president Indianapolis Motor Speedway and the Fisher Automobile Co.; James A. Allison, president Allison Engineering Co.; Walter Marmon, president Nardye & Marmon Co.; Edward G. Sourbier, president Stutz Fire Engine Co.; Lucius M. Wainwright, president Diamond Chain & Mfg. Co.

"It is common knowledge that I have invested a large part of my personal worth in the Midwest Engine Co., which like many other large manufacturing concerns has had its share of troubles due to the present industrial depression," said Mr. Fletcher, in connection with the announcement of disposal of his holdings in the bank. "While I am of the firm belief that it is a matter of no great time until my investment there will be proved entirely sound, nevertheless I am unwilling to let any connection that I have with an outside business reflect in the slightest manner against the bank." Fletcher remains as president of the bank.

Willys-Overland Is Past Peak in Year's Production

**July Mark Reduced to 10,500 Cars;
August Mark Is 6,500 With
September at 2,750**

TOLEDO, July 30—Willys-Overland has passed the peak of sales for the present season, it is believed by officials at the plant here, as orders were posted on Monday calling for a five-day working schedule and lowering of production for next month.

The mark set for July was 12,000 cars. This has been reduced to 10,500 cars and the August mark set at only 6,500. The September schedule is 2,750. These figures are tentative and if the trade continues as brisk as it has been during the last few weeks they will have to be revised upward. The sales for the present week will probably temper the schedule for next month. The trade this summer has been different than any other year largely due to price reductions and forced selling. Rarely has the Overland operated extensively during the summer months.

Force Is Reduced

Last year hundreds of men were laid off and during the next 10 days the force will probably be reduced by 2,500 men. It is planned to keep a normal force of about 5,000 men at work during the fall months.

President John N. Willys declared last week that the operations of the company had been so successful the last few weeks that financially it was now "out of the woods" and that it would go forward in fine shape.

He said that bank loans would be greatly reduced on Aug. 1 by a substantial payment in cash. The company's statement shows a cash balance on hand of approximately \$10,000,000, which will go far toward retiring the \$21,000,000 of loans. The loans were due in May but were extended until November. It is thought that by that time the plans of the creditors' committee will be ready and that a bond issue will be floated as a part of the clean-up for the loans and strengthening of the financial structure of the company.

Mr. Willys declared that never in the history of the company was the \$125,000,000 of assets of the company so efficiently at work as they are now.

"I believe a complete evolution in the method of selling automobiles is in progress," he declared. "Dealers and distributors are conducting their business on sounder lines. They are systematically going after business and are watching their costs as never before. An important matter for the present and future of the industry is the rapidity with which dealers are turning their inventories."

Mr. Willys said that there would be no more reductions on Overland cars. He said the company had gone the whole distance when a reduction of 33 per cent from the peak price was made.

5000 Men Short, Overland Plant Beats Peak Output

7700 Men Now Producing 50 Cars per Day More Than 13,000 Men a Year Ago

TOLEDO, Aug. 1—That the Willys-Overland plant is getting greater production today with 5000 less employees than it did a year ago, was the finding of President John N. Willys while here on a visit to the factory last week.

He said the company with 7700 employees now is producing 50 cars more per day than a year ago when there were 13,000 men at work.

"It is interesting to learn," writes Mr. Willys, "that our business in the last two months has been very close to normal. June and July have averaged between 10,000 and 11,000 cars a month," according to the letter sent to all shareholders.

Harmony Exists in Organization

"Since March I have talked to more than 2500 of our dealers and distributors, and I am pleased to say that since then we have added more than 400 to our dealers' list.

"For the past 10 days I have been studying every detail of the business here, and I find the whole organization working thoroughly in harmony under the director of C. B. Wilson, vice-president in charge of operation.

"A great many economies have been made and we are going to make a great many more. For instance, last week we made approximately 550 cars a day, which is about 50 cars more than a year ago, and the total number of factory employees at present is 7700, as compared to 13,000 a year ago.

"This shows an increase in efficiency that is very gratifying."

Following in line with the reported decrease due for this month in the working force at the Overland, other Toledo subsidiary plants were planning cuts in their forces.

The Electric Auto-Lite Corp. plans on operating through August with very little reduction in its force of 1300 employees. Possibly 100 will be let out. The Overland is reducing its force gradually, paring off a few hundred each week. This week the company shipped several boatloads of cars to Buffalo.

SOMETHING NEW IN PROMOTION

Manitowoc, Aug. 1—Unique financing of a tire manufacturing enterprise is indicated by an announcement of the Manitowoc (Wis.) Association of Commerce that a certain unnamed interest will build a factory producing 30 by 3½ in. cord tires exclusively if from 250 to 1,000 Ford owners will agree to purchase at least one tire at a price of \$20. A production of 24,500 cases the first year is specified. The announcement is accompanied by the following order blank:

"To induce a tire factory company to

establish a factory in this community, I, the undersigned, hereby purchase one, only, of the first lot of 1,000 cord tires made in the new factory, and agree to pay \$20 for one 30 by 3½ cord tire when made and delivered to me and guaranteed for 7,000 miles, with the understanding, however, that this purchase is not binding upon me, until I am notified that: a tire company is incorporated and will install a cord tire and tube factory, in this community, and build 30 by 3½ cord tires and tubes, and has for its officers and directors only such persons as now reside in this community, at which time and under such conditions, but not otherwise, I will immediately deposit with the tire company \$10 and agree to pay \$10 more when I get the tire."

N. A. C. C. Breaks with Chicago Underwriters' Laboratories

New York, Aug. 1—The National Automobile Chamber of Commerce has definitely severed relations with the Underwriters' Laboratories of Chicago, an adjunct of the Underwriters' Association. The last straw was the determination of the laboratories to group cars according to mechanical construction.

The activities of the Underwriters' Laboratories are regarded as too detailed. The inspections interfere with the routine of factory production and result in classifications which are illogical. Parts makers who do not submit to the laboratory tests do not get ratings and as a consequence a car may be unfairly listed because not all of its parts have been supervised, although they may be just as good or better than those which have been inspected by the laboratories.

Few accidents today are due to faulty construction, and automobile makers feel that nothing is gained by the tests in the Underwriters' Laboratories. The high insurance rates are the result of overvaluation and failure to take into consideration the moral hazard. This virtually puts a premium on the destruction of motor vehicles.

HANSON REDUCES PRICE \$600

Atlanta, Aug. 1—Effective Aug. 1, price reductions averaging \$600 on all models were made by the Hanson Motor Co. The new prices compared with the old are as follows:

	New	Old
5-pass. touring	\$1,795	\$2,365
2-pass. roadster	1,795	2,365
5-pass. sport	1,895	2,465
7-pass. touring	1,895	2,465
4-pass. coupe	2,775	3,465
5-pass. sedan	2,885	3,565

CYCLONE TRUCK REDUCED

Greenville, S. C., Aug. 1—Effective Aug. 1, the price of the Cyclone motor truck, Model A, manufactured by the Cyclone Starter & Truck Co., of this city, will be reduced \$115. The old price was \$2800; new price \$2685.

Attacks Constitutionality of Indiana Registration

Superior Court Grants Injunction in Case of Arrest of Man 18 Times

INDIANAPOLIS, Aug. 1—Attacking the constitutionality and legality of the motor vehicle registration laws and asking an injunction to prevent the enforcement of the amended acts of 1913 of Indiana, particularly the amended acts of 1921, chapter 214, which sought to define motor vehicles, classify them, define chauffeurs and provide for licensing thereof, suit has been filed in Superior Court by William F. Frye, owner of an Indianapolis transfer business.

Mr. Frye alleges that the amended statutes are discriminatory, faulty, because the title of the acts is said not to embrace the subject of licensing for revenue, but for registration only for identification and police protection purposes, and take property without due recourse. Mr. Frye asks that the officials be enjoined for collecting fees and taxes for licensing and registration of his automobile vehicles, because Indianapolis police and authorities of Greenfield are said to have declared their intention of making a wholesale campaign on motor vehicles, owners of which have failed to comply with the provisions of the registration laws.

Discriminate Between Owners and Users

It is alleged that the amended acts of 1921 are contrary to the fourteenth amendment of the Indiana constitution, in that the acts provide for taking property without due process of law. The motor vehicle registration section is said to discriminate between owners and users of motor vehicles and provides an unjust and illegal scale of fees to be paid without prescribing means by which horsepower of the motor vehicle shall be gaged; and the title of the acts of 1913, amended in 1915, 1919 and 1921, does not set forth the subject of licensing for revenue, but only for registration purposes of identification and police protection.

A registration fee of \$5, Mr. Frye alleged, has been tendered to Edward Jackson, secretary of state, but Mr. Jackson has refused to accept that amount. Mr. Frye states he was arrested on 18 charges on May 12, 1921, for refusing to pay the alleged excessive registration fee of \$75.

Judge Moll granted a temporary restraining order to prevent Indianapolis police and the sheriff and constables of Marion county and seven adjoining counties from arresting Mr. Frye for violation of the vehicles laws. The court set Tuesday morning at 10 o'clock for argument on the application for the injunction. Among defendants in the suit are: Edward Jackson, secretary of state; Jerry Kinney, chief of police in Indianapolis; William P. Evans, prosecuting attorney, and George Snider, county sheriff.

Concerning Men You Know

Charles B. Shanks is now associated with the Anderson Motor Co., Rock Hill, S. C., as vice president in charge of sales, advertising, sales promotion and service. Mr. Shanks was for 10 years general sales and advertising manager of the Winton Co. and for the last seven years manager of Motor World.

Major Irving C. Moeller, who has been manager of the local branch of the Mack International Motor Truck Co. since the close of the war, has been transferred to the general offices of the company in New York City. He was the guest of honor at a farewell dinner given last Wednesday in Hotel Winton by the Cleveland Automotive Trade Assn., of which he was vice president.

Frank H. Golding, formerly general manager of the Holmes Automobile Co., Canton, O., has been appointed general manager and treasurer of the Fox Motor Car Co., Philadelphia, and H. O. Swanson, formerly in the service and engineering departments of the H. H. Franklin Co., makers of Franklin air-cooled cars, has been appointed chief engineer.

Frank B. Ansted, president of the United States Automotive Corp., has organized a new subsidiary, the Fayette Painting & Trimming Co., with a capital stock of \$500,000 in common shares. The officers are: Frank B. Ansted, president; Frank M. Crawford, vice president and general manager, and R. E. E. Hanson, secretary and treasurer.

A. W. L. Gilpin, for six years manager of the Milwaukee branch of the Ford Motor Co., who on July 1 was promoted to district manager, was tendered a banquet at the Milwaukee Athletic Club by 208 Ford dealers of Wisconsin. Mr. Gilpin has transferred his headquarters to Chicago.

C. L. Davis, formerly manager of the Milwaukee branch of The Winton Co., and for the last two years sales manager of the Overland Wisconsin Co., Milwaukee, has become associated with the Stearns Sales Agency, 156 Farwell Avenue, Milwaukee, as manager of wholesale sales. The Stearns Agency is state distributor of the Stearns-Knight and Rolls-Royce.

Sterling H. Keene, service manager of the National Motor Car & Vehicle Corp., Indianapolis, has been granted a leave of absence to enter the U. S. Public Health Service Hospital No. 60, at Oteen, N. C., so that he may completely recover from the effects of being gassed during military service in France.

J. T. Madden leaves the Southern Oakland Co. and joins Southern Nash Motor Co., distributor of Nash cars and trucks, also LaFayette cars. For five years he has been identified with the Southern Oakland Co., first as traveler in the Carolinas, then manager of the Charlotte branch, and for the past three years general sales manager for the entire southeast.

Urges Greater Production to Avoid Tire Shortage

Akron, O., July 29—Business conditions are improving rapidly on the Pacific coast, with every indication of a quick return to normal, according to A. F. Osterloh, former sales manager of the Goodyear Co., of Akron, and now vice president and general manager of the Goodyear Co. in Los Angeles.

The Los Angeles Goodyear factories have increased production 47 per cent since March, now being on a basis of 3,500 casings and 3,700 tubes daily, according to Mr. Osterloh. This is the largest production in the history of the western company, which started production in June, 1920. With the demand for tires steadily increasing, further production increases are contemplated, both in Akron and at the Pacific Coast factories.

The Akron factories report this week's dealers' business was the heaviest in the company's entire history. Stocks are low and indications point to a tire shortage if the present rate of buying continues, and manufacturers do not greatly increase production. It is stated by experts that there is now less than a 30-day supply of tires on hand in the United States.

LAMP LIGHTERS WATCH AUG. 16

Columbus, O., July 29—The law enacted at the last session of the Ohio General Assembly regulating the glare of headlights becomes effective Aug. 16. The new law provides that no headlights can be used on the highways and streets of the state unless covered by a lens approved by the Ohio Highway Commissioner.

The provisions are that a light shall be used to disclose any person, vehicle or object for a distance of 200 ft. ahead of the car and no dazzling rays shall be used more than 3½ ft. above the sur-

face or more than 75 ft. ahead of the car. No lamp shall be more than 32 c. p., nor shall a spotlight be used except when projecting its rays directly on the ground at a distance of 50 ft. in front of the vehicle and to the right of the center of the roadway. Heavy fines are provided for violation of this law.

JORDAN SOLD FOR FOUR MONTHS

Cleveland, July 31—Jordan distributors here for a meeting at the factory of the Jordan Motor Car Co., were told that factory capacity for the next four months has been sold and that production will be maintained at the organization's highest average. The Jordan company, during the quarter just ended shipped 10 per cent more cars than in the same period last year, which was the peak of the automobile sales boom. Distributors reported fewer cars on their floors July 15, than at any previous time in the company's history. This is attributed to the sales increase which followed the price reduction in May.

Inaugurates New Plan in Establishing Subdealers

San Francisco, July 31—A new plan of establishing sub-dealers was announced at the distributors' conference of the United Motors Service, of Detroit, held here in July. F. A. Oberheau, sales manager, and J. W. Parry, manager of the technical department, came on from the general office, and worked in conjunction with H. J. Calvin, western district manager, and C. R. Johnson, San Francisco branch manager, throughout the conference.

It was decided to appoint registered dealers through authorized distributors; to establish a regularly appointed dealer in all centers of the northern California territory, and to require each dealer and sub-dealer to maintain a representative stock of Delco and Remy electrical

parts. The purpose of the new dealer plan is to establish and maintain:

- 1—More points of contact for the automobile owner, which is to say, more abundant and more convenient service.
- 2—Greater volume and more facile distribution of service parts.
- 3—Assurance to both the car dealer and the automobile owner that genuine materials and equipment produced by the manufacturers will be always available at the most convenient points.

Chicago Rumor Declares Ford Will Build 2-Tonner

Chicago, July 28—It is rumored in Chicago that the Ford Motor Co. is to bring out a 2-ton truck. The Ford-like market for a truck of this capacity seems assured when motor truck figures for 1920 are studied. Of the machines produced last year 80 per cent were 2-tonners and under. This would give Ford more than a fighting chance at four-fifths of the truck market of the United States.

PACIFIC HIGHWAY OPENS SOON

San Francisco, July 31—The Pacific Coast Highway, beginning at Tijuana, Mexico, and ending at the British Columbia line, will be opened officially on Sept. 6, this year. The road is 2,000 miles in length and follows the coast line closely, offering views of the Pacific ocean at its most beautiful points for hundreds of miles. Through Washington and Oregon it passes back into the higher mountains, about one hundred miles from the sea and affords some of the finest mountain scenery of the Cascades and other northern ranges. The highway is in such condition at present that all but about one hundred miles at the northern end can be traversed in comfort.

C. A. E. A. SHOW IN FEBRUARY

Winnipeg, July 28—The second annual automotive equipment show staged by the Western Canada Automotive Equipment Assn. will take place here Feb. 6 to 11 (both dates inclusive), 1922. During these dates the annual Bonspiel is held in Winnipeg and attracts thousands of visitors to the city from all parts of Manitoba, Saskatchewan and Alberta.

The Winnipeg show is the only exclusive automotive equipment exhibition staged in Canada and the success met with last year convinced the manufacturers and jobbers of Canada that an early start for 1922 would result in the putting on of a far bigger and better show than even the one held in 1921. Those interested can obtain full information by addressing W. L. Williams, secretary, New Stovel Bldg., Winnipeg.

H. C. S. REDUCES PRICES

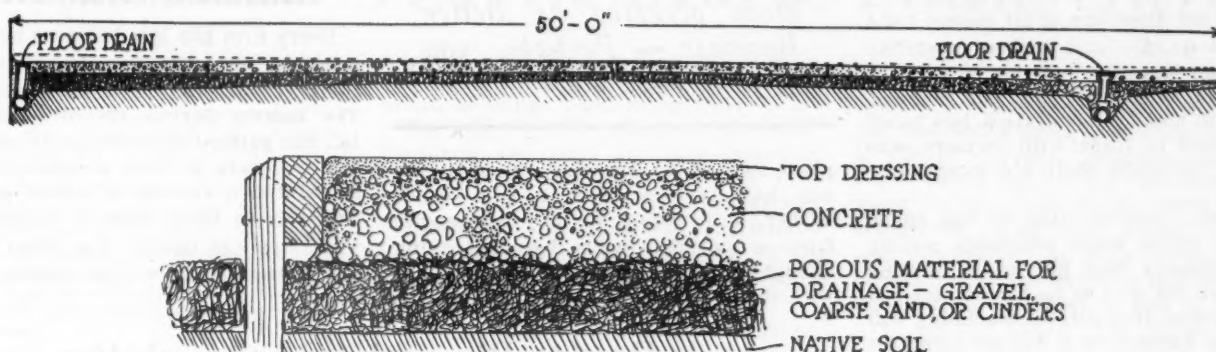
Indianapolis, Aug. 1—The H. C. S. Motor Car Co. of this city, manufacturer of the car designed by Harry C. Stutz, has announced a reduction in price on three of its models, which became effective Aug. 1: roadster, \$2,925 to \$2,725; four passenger touring, \$2,975 to \$2,775; coupe, \$3,650 to \$3,450; a reduction of \$200 on each model. The four-passenger sedan is listed at \$3,650.

Automotive Architecture

Planning & Building Problems

Conducted by Tom Wilder

Building a Garage Floor



Above is a cross section of the floor of a 50 ft. garage. Below, a detail of construction

CEMENT concrete is the acknowledged material par excellence for the garage floor.

Wood is condemned as being short-lived and usually out of repair. Boards placed as close to the ground as is usual with garage floors rot in a short time. They also tend to warp both transversely and longitudinally by reason of the under sides being damp and the top dry; thus they pull loose from the under-pinning on account of the timber rattling and failing to hold the nails.

Wood blocks make a good pavement, but unless creosoted, are also short-lived, and the creosote is said to be injurious to rubber.

Before starting a concrete floor it is well to study the situation as regards water pipes and drains. If there is any filling to be done the nature of the soil must be considered.

It is not safe to lay concrete over clay that has been filled, as the floor will surely settle. Gravel will immediately settle to a solid bed as will sand if wet down sufficiently to wash it into any crevices that may exist under it. Clay is quite different from sand and gravel, though sandy clay is not quite as bad as gumbo or any of the more sticky clays.

If clay must be used, it should be placed when as dry as possible. After it is laid it should be soaked with water until virtually soft and incapable of supporting a person's weight. When it has dried it will be as dense as it can be made without process of time and will have settled from 10 to 24 cent of its original height.

The drainage of the floor should also be considered before the work actually begins; a puddle of water on the floor after a heavy rain is never desirable.

Circumstances determine the method of draining in most cases. Sometimes it is most convenient to give the whole

Automotive Architecture

IN this department MOTOR AGE aims to assist its readers in their problems of planning, building and equipping service stations, garages, dealers' establishments, shops, filling stations, and in fact any buildings necessary to automotive activity.

When making requests for assistance please see that we have all the data necessary to an intelligent handling of the job. Among other things we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor. Number of cars it is expected to garage.

Number of men employed in repairshop.

And how much of an accessory department is anticipated.

floor a slight pitch in one direction—towards the side, front or back. The best method, however, appears to involve making the center the highest point. In a long garage, 50 ft. by 100 ft., this high point would be a line 75 ft. long through the center; from this line the floor should fall off towards the walls at the rate of about one inch to 10 ft. The lowest point may be close to the wall, or it may be four or five feet from the wall, so as to come under the row of cars. Along this low line a tile must be laid below the floor with drains, protected by cast iron grills entering it every 10 to 14 ft.

If the foundation soil is such that it becomes soft with moisture, it should be sloped slightly toward the drain tile, in

the same way as the floor, so that no water can collect under the floor. When this is done, the bed material of cinders, coarse sand or gravel is spread and tamped thoroughly to within three or four inches of the finished floor.

Strips of 2 by 4 are usually used as grounds; they are spaced 6 to 8 ft. apart and held in place by stakes and cross divisions placed the same distance apart as the grounds forming square blocks. When the filling is started every alternate space is filled; then the cross pieces are taken out and the remaining spaces filled.

The proportions of cement and gravel for the base are as follows:

Good quality bank gravel—1 part cement; 5 parts bank gravel.

Washed gravel or crushed stone—1 part cement; 2½ parts torpedo sand; 5 parts 1 in. gravel.

For the top dressing:

1 part cement; 1½ to 2½ torpedo sand.

Fill the forms with the base mixture to within ½ to ¾ in. of the top. Tamp well and finish with the top dressing, smoothing and striking off with a perfect straightedge. Never let the base dry out before the top dressing is added or they are liable to separate and the top scale off.

After striking off, it should stand an hour or so for the excess water to settle before trowling is started. A wooden trowel is best for use in evening up, then after an hour or more the steel trowel may be used, if a smoother job is desired. Some desire the rougher surface given by the wood float, but there is little chance of cars skidding inside the garage, and the smoother surface is more easily kept clean.

Sometimes instead of the fine cement top dressing asphaltic compositions are applied. They make a less harsh and less crumbly surface, but eventually get soft from the constant applications of oil.

Better Business

Money-making Ideas

Selling Old Machines at Auction

A plan for disposing of all second-hand machines quickly and without spending much time has been evolved by Charles Holmes, of Kingsbury, Ind. Mr. Holmes, along with many other dealers, has found it advisable to trade with farmers who want to exchange their old implements for new.

He finds, however, that he can spend his time much more profitably selling new equipment than he can in hunting buyers for old, and so he has established it as a policy that all old machines will be sold at auction on a day set aside for the purpose. This has been entirely satisfactory for him. Of course it is impossible to control the prices, but his experience enables him to determine the amount of allowances it is safe to give on old equipment.

Mr. Holmes watches the bidders carefully during the sale and makes mental notes of those who bid, but do not make a purchase. These people he goes after in an effort to make sales of new tractors, and usually lands a big percentage of them. In other words, the auction sale provides a means of getting prospective customers to his place of business, disposes of his second-hand equipment, and gives him a nice list of active prospects. It also serves as a subject for newspaper publicity, all of which helps to build up a permanent and successful business.

Plays Up Flat Rate Service

A northern Indiana garage has plastered the roads leading to the town where it is located with road signs which not only tell the distance to the garage but which also carry this important sales talk: "We will give you exact prices before commencing work on your car."

The flat rate service of this particular garage is undoubtedly its best selling point, and the owner of this garage has been wise enough to realize this fact and to play it up. Would it not be a good plan for other garages which are on a flat rate basis to do the same sort of a thing?

Salesmen Set an Example In Use of Accessories

The Barton Motor Co., of Burlington, Ia., believe in having their salesmen set an example in the use of accessories. It is their contention that a salesman cannot sell and is not acquainted with the merits of an accessory that he does not use on his own car. As a result, every salesman's car is equipped with a com-

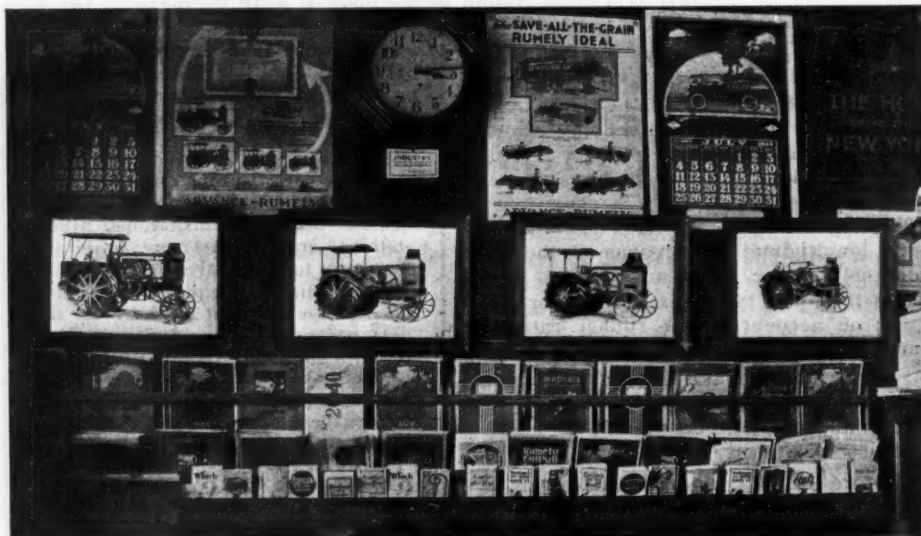
A dollar will be paid for all ideas accepted as Better Business — Perhaps you have some

plete line of accessories. We will not buy hair restorer from a bald-headed barber, why should we buy accessories from a salesman who does not think enough of them to equip his own car with them?

Making the Place of Business Distinctive

Every firm has lost business because it was hard for satisfied customers to direct their friends to the place of business. The Battery Service Co. of Washington, Ia., has painted its store so no one could fail to locate it from a description. It is painted a variety of colors arranged similarly to those used in camouflaging war ships and tanks. The effect creates much attention as well as making it distinctive.

It Pays to Please the Customer's Eye



IT pays to please the customer's eye. Eighty-seven per cent of all the impressions a person gets in the course of a day are obtained through the eye. The other senses play a much less important part. It is for this reason that an attractive display of merchandise—or literature advertising that merchandise—pays such handsome dividends to the dealer. It is for this reason that it has been profitable for the manufacturers to prepare attractive literature. But how much good is that literature going to do the dealer unless he makes effective use of it?

A very interesting display is shown in the illustration herewith, of one side of the office of Harvey Smith, a dealer at Bassano, Alberta, Canada. Enlarged photographs of the tractors he handles, framed pleasingly, and striking motor calendar posters ornament the wall. Below is an inexpensive sample rack in which the literature supplied by the manufacturers is placed, within easy reach of every visitor.

When a customer comes in to make a

purchase, he is attracted by some piece of literature—either because of the cover design or because of the fact that he is interested in that particular tool. He picks up the booklet, looking it over right there, or putting it in his pocket to be examined later. The result may be an immediate sale or it may be the starting of a train of thought in the mind of the customer which will eventually result in a sale.

The chief requisite of a literature display rack is that it be big enough to display the different kinds of literature separately and that it be located where every visitor to the office may have easy access to it. If you desire to call attention to a certain article, place the literature in one or more prominent positions in the rack. Advertisers have found that color adds 25 per cent or more to the value of advertising literature, some colors, notably red, being more attractive than others. By making use of these facts in arranging the display, it will be possible to secure excellent results.

Legal Problems

Conducted by Wellington Gustin

Prevention Worth More Than Cure

Q—Jones Auto Co. is the dealer and Smith the purchaser. Smith buys two trucks with the understanding that he shall be made safe in making his payments on trucks which have been financed by a regular finance company taking care of automobile notes.

The Jones Co. in good faith guarantees that it will see that Smith gets work for the two trucks, but because of general business conditions it is unable to find any work and Smith has to store his trucks and defaults the bonding company's notes.

Now what damages has Smith got against the Jones Auto Co., in case the financial company forecloses and takes the trucks away from him, after his having paid one-third down cash and \$1000 on notes.

What would the damage be if the financial company carries Smith over and does not foreclose? Smith is already behind, say \$3000, on notes past due, whereas had Jones & Co. furnished work as agreed he would have been able to meet the notes as they came due.—Zea & Fitzwater, New Paris, Ind.

Uncertainty in Agreements

Note the looseness and general terms of these agreements.

The first question is whether they are specific and definite enough for a court to enter a judgment on them if the matter is taken to court. One rule of law as to construction of contracts is that that is certain which can be made certain, by reference to other known matters. The provision to keep "supplied with work so there is absolutely no reason why they should not be at work every working day," is open to attack because of lack of definiteness as to the meaning. No doubt, the intention was for a full day's work for a full day's pay, but the words do not say so. It might be that certain small jobs might be found every day and work given every day as agreed, and yet not enough work any day to make a full day. In other words, the contract might be complied with by giving so small an amount of work that it would not pay the truck owner.

Damages for Breach of Contract

Again the price for trucking is not stated. Suppose this salesman or his firm got plenty of work at a rate below competitors? Cutting the price might get plenty of work, but the contract price might be so low as to allow no profit, so that should action be brought to recover damages, none could be shown. Every contract stands on its own terms and facts, of course, coming under general rules of law. I have here pointed out

the lack of definiteness such as a court would be called upon to consider.

The seller admits obtaining no work. How may the court and jury arrive at the damages occasioned thereby? Perhaps you can show that the contract was not complete as written and may supply the information by oral testimony. If so, the agreement should be good, and damages had for a breach.

Now the damages Smith, the buyer, would have against the Jones Auto Co., the seller, would be the profits or earnings he should have made, had the seller not breached the contract. This brings us back to the proposition as to how these damages may be ascertained. If prices were decided on in the contract the question might be simple; so also if there may be a reference to facts making prices certain from which loss of profits may be recovered; yet they must be capable of ascertaining with reasonable certainty. Reasonable certainty of proof is, however, sufficient to satisfy this law. A recovery of speculative or conjectured profits will be denied.

Notes Not Good Against Purchaser

On almost the same facts different courts have arrived at directly opposite decisions in the question of profits.

The foregoing is advisory on this kind or class of contracts showing the difficulty of enforcing one's right after a breach. This is the case where an ounce of prevention may be worth a pound of cure.

But coming to the agreements again: a question of fact arises whether the sales manager is an agent of the company to make contracts and to make this additional provision. If the facts show that he was acting within the scope of his authority, then the stipulation is still of no avail against the purchasers of the notes who have no notice of same. If the notes are the regular promissory or negotiable notes and in the hands for value of purchasers in good faith, then such holder may bring action according to the terms in the note and the maker cannot set up such agreement extending the time for payment. Of course, if the holder of the notes had notice of such agreement he would be bound thereby.

Remedy Open for Buyer

If the seller agreed or acquiesced in the making of the notes and insurance to the financial company, then the seller may not now complain.

The course for the buyer to pursue under his contract would be to sue for the reasonable value of the lost earnings of the two trucks. Evidence might be had from the other truck operators, operating the same size trucks under similar conditions, as to their actual earnings and thus arrive at their earnings and profits lost by the buyer in this case. The difficulties possible to be met by him we have set out above. The results of an action are none too certain and we advance no opinion.

Now, coming to your letter: you state that the buyer has an "understanding that he shall be made safe in making payments on trucks." This is not shown in the written agreement, which only undertakes to secure work. However, if the buyer can show that the written agreement was not complete this additional provision may be proven by oral evidence.

Where Impossible to Perform Contract

A slump in business is no defense to a contract which makes no provision therefor. The seller cannot urge that as an excuse for his failure to perform his agreement. Impossibility of performance of a contract ordinarily relieves one of the duty to perform. But one is bound to do what is absolutely contracted to do, and slump in general business or otherwise does not come under the category of "impossibility of performance."

What Does "To Make Safe" Mean?

If it can be shown that the seller agreed to make safe the buyer in payment in the notes, as you indicate, which was not done, then the buyer should be able to recover for this breach all the loss he suffers thereby. This would be the value of his equity or interest in the trucks.

If the holder of the notes, the financial company, does not foreclose on the notes, then Smith would have no claim under this provision of the contract, for it would not be breached. But here comes up another question, a dispute as to the meaning of "shall be made safe" in making payments. We are of the opinion that this meaning has reference to extension of time for making payment, and if the finance company gives this time there could be no damages shown in this particular, and only damages could be claimed for failure to provide work.

The Readers' Clearing House

Questions & Answers

CONDUCTED BY WM. H. HUNT

Technical Editor, Motor Age

Which Is the Fastest, Gas or Steam?

Q—How fast will a Stanley steam car go?

2—How far will it hold that speed?

3—Will a Stanley beat the fastest of gas cars from a standstill?

4—How long will it stay in front?

5—Is a Stanley barred at Indianapolis?

6—What chance would it have if admitted?

7—A Zenith carburetor salesman states the Hudson carburetor is a Zenith product made by the Zenith Co. Is he not in error?

8—Is not the Ball & Ball carburetor a direct copy of the Zenith?

9—If the so-called clutch brake was removed from the average car would it not be entirely practicable to drive it?

10—On any car with gears in mesh and clutch thrown out or released is it true that the car will not move? In other words with pressure on a clutch removed there is no driving contact or friction?—H. Bushnell, Chicago.

1 and 2—A specially built Stanley racing car has a record of one mile in 28½ seconds. Although the Stanley Motor Carriage Co., makes no definite speed claims it is asserted that the stock machine will develop 75 m.p.h. for short distances or 60 m.p.h. up to 200 or 300 miles.

3 and 4—To reply to these questions would place us in the position of comparing the relative merits of cars. This is counter to our policy.

5—All contests of whatever nature must be conducted under well defined rules in order that all contestants may have an equal chance. As it has been found to be impossible to formulate rules which would be equally fair to gasoline

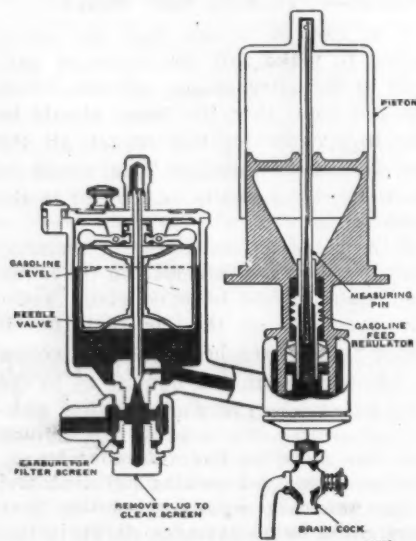


Fig. 1—Hudson carburetor, sometimes confused with the Zenith

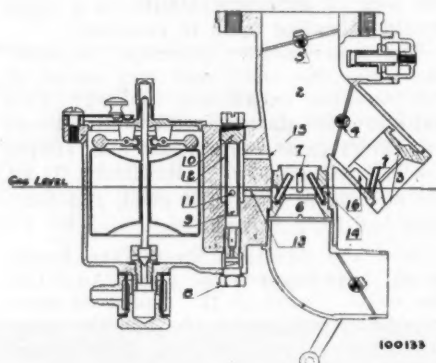


Fig. 2—Ball & Ball Carburetor made by the Penberthy Injector Co.

and steam machines these have not been driven in competition for several years. In the broader sense the Stanley car is not barred from the Indianapolis track but may be entered in competition with other makes of steam cars under the rules of the American Automobile Assn. governing such contests.

6—There is no basis for comparison, but it is quite likely that a Stanley steam car especially built for racing purposes would give a very good account of itself.

7—The salesman fell into a very natural error as the 6-40 Hudson was Zenith equipped, and although the present model of Hudson car is equipped with a Hudson carburetor many of the parts of the latter are interchangeable with those of the Zenith carburetor. A comparison of the illustration in Fig. 1 and 3 will show the radical differences between the two carburetors.

8—No, again compare the illustrations in Fig. 2 and 3 and note the differences in construction between the Zenith and the Ball & Ball carburetors.

9—Clutch brakes were unknown for a number of years. Any skillful driver can operate a machine from which the clutch brake has been removed.

10—As the clutch is the member through which the power is transmitted from the engine through the transmission and so to the rear axle, naturally, if it is disengaged the engine will simply run idle and not drive the car.

CORRECT ADJUSTMENT OF STROMBERG CARBURETOR, TYPE LB.

Q—We are having some trouble with a 1917 Haynes which is equipped with a Stromberg model LB carburetor. It has three adjustments: high, low and idling. We have tried to set this carburetor but cannot get the adjustment for all around driving. We can set it for fast driving

and it works fine, but will not work well at slow speed or pulling on hills. What can be done for it, and would you advise any other kind of carburetor?—Wm. C. Dusell, Montevideo, Minn.

You fail to mention the general condition of the engine. Assuming that it has given four years of service, it would not be at all surprising if the pistons, rings, valve stems and guides are so badly worn that a perfect adjustment for all speeds would be impossible with any carburetor. The detailed instructions herewith, if followed closely, should give satisfactory results, provided the engine is in fairly good condition.

Reference to the illustration in Fig. 4 will make the instructions clearer. This is a plain tube type carburetor, having the air passages fixed in size while the gasoline is automatically and accurately measured by the air flow itself for all speeds and loads. This uniform operation is made possible by the air bled nozzle construction. For high speeds the gasoline, after passing the orifice "F," is mixed with air taken through the bleeder "G," to the right and behind "A," and air holes in "H" to form a highly homogenous mixture which is discharged through eight holes into the small venturi.

For low speed the gasoline does not enter the venturi at all, but is taken

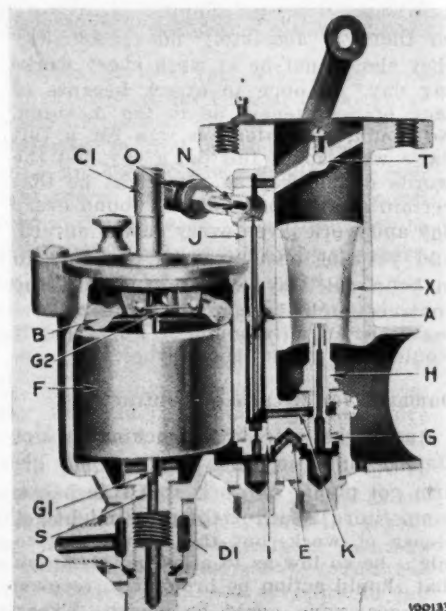


Fig. 3—Zenith Carburetor. Note the points of difference between the three different makes

through the hole "J" to above the throttle, entering through the idling jet "K." The accelerating well "M" serves as a reservoir, which discharges on acceleration and refills on deceleration, thus giving extreme flexibility without requiring any abnormally rich adjustment of the steady mixture.

There are three adjustments as follows: "A," the main adjustment, controls the gasoline supply from the float chamber, regulates the mixture through the whole driving range, and should be set so that the engine shows its best life and power. Turning nut "A" clockwise raises the needle and gives more gas; anti-clockwise, less gas. If an entirely new adjustment is necessary, turn nut "A" anti-clockwise, thus lowering the needle until it just seats (as shown by its sticking slightly when raised on lifting "A"); then turn "A" 24 notches clockwise, which should give a mixture somewhat rich. After starting and warming up the engine, this adjustment may be regulated as necessary for the best driving mixture.

Adjustment for Idle.

The gasoline for idling is taken in above the throttle and controlled by dilution with air from the inside of the carbureter, as regulated by the screw "B," which should be between $\frac{1}{2}$ and $1\frac{1}{2}$ turns to the left, or anti-clockwise from the seating position. After the engine is warm this may be regulated as necessary, turning to the right for more gas and to the left when less gas is required. Note that idle adjustment is effective only when the throttle is nearly closed.

Economizer Action.

As the throttle is open it will be noticed that at closed and wide-open position the nut "A" and needle "E" are stationary, but at positions corresponding to speeds from 10 to 35 m. p. h. the needle drops so that "B" rests on "D." This function is based on the fact that a richer mixture is required for full power and wide-open throttle than for closed throttle driving, when economy is the main consideration.

The amount of this economizer action, or drop of the needle, depends upon the clearance shown at "X" and is controlled by the position of the pointer "L," the extent of the action and consequent leanness of mixture increasing with the number of notches. To make this adjustment, retard the spark, open the throttle to about a 20 m. p. h. position and set the pointer one notch less than the thinnest mixture on which the engine will run steadily when warm. It will usually be the third or fourth notch.

Starting and Warming Up.

For starting and warming up with the present-day fuel, it is absolutely necessary to use the dash or steering post control until proper operating temperature is attained. Ordinarily the engine will start readily with the control closed $\frac{1}{2}$ to $\frac{3}{4}$ of the way. In very cold weather it may be necessary to pull the control up all the way, but this should be

The Readers' Clearing House

THIS department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

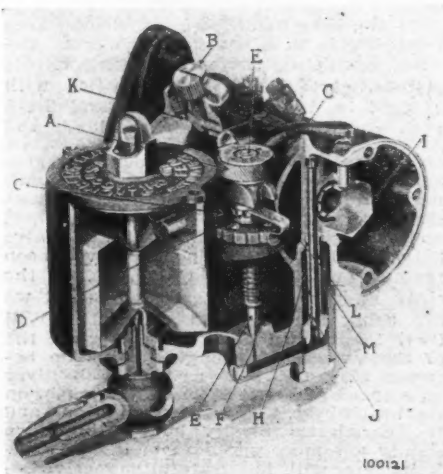


Fig. 4—Stromberg Model LB carburetor with adjustment reference letters

done only for an instant, as this cuts off all the air and delivers gasoline only.

In starting, the throttle should be nearly closed, or it may be opened and closed while the starter turns the engine over. After starting, the control should be drawn up as necessary and, allowing the engine a moment to steady itself, should be set at a point where the engine will have full power and yet not too rich a mixture for smooth running. As the engine warms up, the control may be lowered. Instead of setting the mixture permanently rich it is much better to use a moderately lean one and then give intelligent attention to the operation of this control. In the warm months the season adjustment shutter on the hot air horn should be opened to admit cold air.

BUILDING FORD RACING CAR

Q—We want to build a Ford car for a $\frac{1}{4}$ mile dirt track racing that will make a speed of 75 m. p. h. Advise at once about it. We do not want to use a 16-valve head unless we have to.—Levine's Service Garage, K. Levin, Tyler, Tex.

The usual practice is to fit the engine with light weight pistons ground so as to allow a wide clearance and to ream out the valve seat and exterior ports large enough to accommodate the size of valve used in the Fordson tractor. It is also necessary to increase the tension of the valve springs. Some builders attempt

to change the engine timing or the valve lift by advancing the camshaft gear one tooth or by grinding the cam. Neither of these practices is recommended. A better plan is to procure a high speed camshaft from any one of a number of firms manufacturing them.

Another procedure which has the effect of increasing engine speed is to take a cut off of the flywheel, lightening this member to 11 or 12 pounds. It is found of benefit to increase the gear of the car by installing special ring gears and pinions which may also be secured from several sources. It will also be well to undersling or lower the chassis by means of specially designed fittings. That you can attain a speed of 75 m. p. h. by following the above recommendation is possible, although we do not care to vouch for it. We believe you would do well to purchase a 16 valve-head.

STARTING MOTOR COMMUTATORS RARELY NEED UNDERCUTTING

Undercutting of starting motor commutators is rarely necessary for the reasons that the machine turns but few times as compared with a generator and that it does not need to build up, current being supplied from the battery.

ENGINE TEMPERATURES AND OIL VISCOSITIES

Q—What is the average normal running temperature of an automobile engine?

2—What is the correct viscosity of oil at the running temperature?—Kansas City Oil Co., Kansas City, Mo.

1—The absolutely correct temperatures vary with the makes of engines. An average of the temperatures recommended by three eminent authorities is 188 deg.

2—There is no arbitrary rule for this, the various brands and grades of oil varying in viscosity.

HELPFUL BOOKS ON THE SUBJECT OF AUTOMOBILE MAINTENANCE

Q—Recommend some books on automobile repairing which will be helpful to a mechanic. I would particularly desire a good work on the subject of overhauling engines.—L. E. Reed, Garage & Service Station, Charles City, Ia.

The following works cover the subject of automobile construction, repair and maintenance very thoroughly:

Dyke's "Automobile and Gasoline Engine Encyclopedia." A. L. Dyke Publishing Co., St. Louis, Mo.

"The Ford Car. Its Operation and Repair," Victor W. Page. The Norman W. Henly Pub. Co., 2 West 45th Street, New York.

"Questions and Answers on Automobile Design and Construction," Victor W. Page. The Norman W. Henly Pub. Co., 2 West 45th Street, New York.

"Automobile Ignition Starting and Lighting," Hayward. American Technical Society, Chicago.

"Simplified Guide to Correct Automobile Wiring." Associated Electric Service Stations, Suite 412-105 West Monroe Street, Chicago.

"Electrical Equipment of the Motor Car." U. P. C. Book Co., New York.

ENGINES

TWO METHODS OF TIMING HUPMOBILE

Q—Publish the correct markings for timing gears on Hupmobile car No. 15673. You gave a valve setting of this car in *MOTOR AGE* some time ago, but as the marks on the gear teeth have been worn off, we are unable to time it properly.—M. R. Stuart, Kernersville, N. C.

When timing this engine reference to the marks on the gears should not be made, because they have no bearing on the engine timing. The appearance of the chain with the front cover removed is shown in Fig. 5. There are two timing methods. The first is as follows: turn the engine over until the marks "Intake Opening" on the flywheel line up correctly with the line on the housing; turn the camshaft gear until the intake cam is just beginning to lift the intake valve cylinder on No. 1 cylinder; place the chain in proper position and allow just a little slack.

The second method is as follows: remove the cylinder head so that it will be possible for you to measure the distance of piston travel. Turn piston of No. 1 cylinder $5/16$ in. past top dead center on the intake stroke, which is, of course, when the piston is traveling downward. Turn the camshaft so that the intake valve is just ready to open then place the chain in its proper position. The amount of slack that is permissible is shown in Fig. 7.

In order to place the chain on the gears it may be necessary to loosen the rear engine bolt, place a jack under the bottom of the oil pan near the front and raise the engine slightly. If the methods outlined are followed the engine will be properly timed.

POWER CURVE OF CHALMERS ENGINE

Q—Publish the power curve of the present Chalmers engine?—B. W. Alexander, Queen City, Mo.
See Fig. 6.

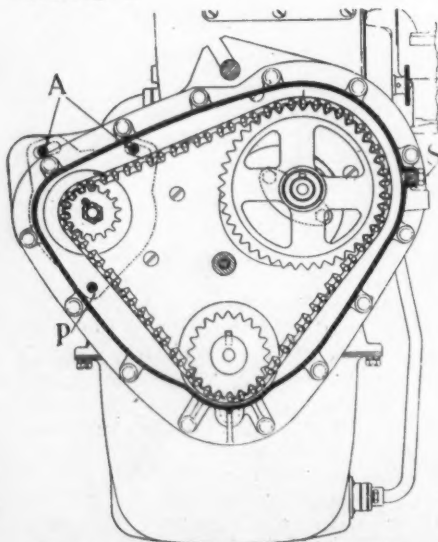


Fig. 5—Hupmobile timing gearcase with cover removed showing chain and adjustments

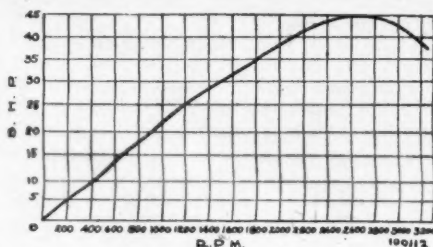


Fig. 6—Power curve of Chalmers engine

COMBINATION FA-490 CHEVROLET RACING CAR

Q—We have installed a model FA Chevrolet engine in a model 490 chassis. Besides equipping the engine with Lynite pistons, carefully balanced, drilled with $22\ 7/16$ in. holes in the skirt and fitted with a clearance of .012 in the lands and .010 in the skirt, we have planed $5/32$ in. off the top of the block in order to give more compression and are using a Simms magneto type C4 for ignition. We have also turned 20 pounds from the flywheel and lightened the push rods and valve lifters. The valve ports have been reamed out from $1\ 1/4$ to $1\ 1/2$ in. in the clear, and the valve stems drilled but we are using the standard camshaft. Will there be any benefit in increasing the lift of the valves. The engine turns up between 2250 and 2350 r.p.m. which gives us a speed of between 70 and 75 m.p.h. on the beach here. The get-away is fine and the car hums nicely, but I think we should get more speed from it. Any information will be gratefully received.—Southern Motors Co., Jacksonville, Fla.

You are to be congratulated upon having built a very interesting car. We are of the opinion that cams giving a higher valve lift will have the effect of increasing the engine speed and, consequently, the car speed. We also believe it likely that the engine with the present shaft would pull the car up to speed if it was equipped with the larger wheels from the FA model. We would recommend trying this if the expense of making the change is not too great.

HOW NOT TO MAKE AN INQUIRY

Q—We have had trouble with a Stephens Salient Six oiling system. It will stop pumping and after priming, sometimes it will pump and sometimes it will not. We have examined the oil pipes and found them tight; they do not suck air. The oil pump was taken out and was in good condition. Can you give us possible causes. It is a force feed system.—R. A. Adams, Grand Junction, Colo.

We regret that we are unable to reply to your inquiry intelligently for the reason that you have not supplied us with sufficient data. The name Stephens Salient Six means nothing as an identification for the reason that it has been applied to the car ever since the original model was turned out in 1916. During this time three types of pumps have been used besides that on the Continental engine with which the car was at one time equipped.

Sometimes it is difficult to identify a car model, but in this case it is not so

as the serial number may be found on the right side of the dash under the hood. If you will oblige us with the serial number we will be very glad to determine what model car you have, what type of pump was used and how it should be adjusted.

REBORED ENGINE HAS AN ANNOYING CLICK

Q—How much end play can be allowed in the crankshaft of a 1917 Hudson Super Six car? Can .010 in. of play cause any noise?

2—We rebored the cylinders and now there is a click in one of the two center cylinders which sounds like a loud tappet click and is at camshaft speed. It is not in the valve assembly as we have renewed all valve guides, valves, tappets, and tappet guides and camshaft bearings and the adjustment is as close as can be tolerated. We have even changed valves several times but the click persists. We do not think it is caused by any defect in the boring job as this was done very carefully, but the wrist-pin holes were reamed on account of not being able to get standard pins. Could these be reamed out of square with the cylinders and could this cause a clicking noise, or do you think it is caused by a badly fitting ring? How would you go about finding the cause of this noise?—Frank R. Kutschenreuter, San Antonio, Tex.

1—This small amount of end play should do no damage unless one of the connecting rods is so close to a piston at the wrist pin end that the amount of end play will allow it to touch.

2—The foregoing may be the cause of the click. It is also quite possible that the pistons were reamed out of square. This should not have caused the click to develop immediately as some time would have to be allowed for wear.

A badly fitting ring many times gives rise to the clicking noise. It can usually be detected by injecting a few table-spoonsful of 600 W oil or glycerine into the combustion chamber. If the rings or a ring are at fault the heavy lubricant will take up the lost motion and, acting as a cushion, eliminate the click for a short time. Cutting off the ignition from the suspected cylinder should eliminate the noise if it is caused by a badly fitted wrist pin or connecting rod bearing. However, the final and really the only satisfactory method of locating the last named will be to disassemble and examine the suspected parts.

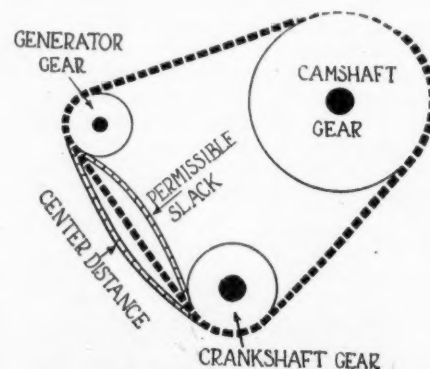


Fig. 7—Diagram of Hupmobile timing gear and chain layout showing the permissible amount of slack in the chain

MISCELLANEOUS

FOCUSING NEW FORD HEADLIGHTS

Q—1—Regarding your article of June 16 on how to adjust headlights; a Ford car, 1921, (no starter), has been equipped with Patterson headlamp lenses, and I would like to know if the adjusting method should be used before or after installing these lenses? The lenses pass the new state law.

2—How does the small adjusting screw situated back and near wire plug affect focusing and which way should it be turned to broaden or make the beam of light narrow and to eliminate black spot in center of beam of light?

3—Now the light seems to be thrown close to the ground when 40 ft. away from a wall; that is, the circles are each about 4 or 5 ft. in diameter and about half of the circle is on the ground. Should I bend headlamp brackets so light is thrown higher? — Clifford Peterson, Omaha, Nebr.

A complete description of the new type of Ford headlights with instructions covering the proper focusing of them appeared in the April 14 issue of *MOTOR AGE*. Following is a reprint of part of the article which we believe will answer all your queries satisfactorily.

The new Ford lamp comprises the standard Ford parabolic reflector with $1\frac{3}{8}$ in. focal length. The lens has the upper part painted green to form a visor which extends $\frac{5}{8}$ in. below the center of the lens and tapers upward to a distance of $1\frac{1}{8}$ in. above the center line at each side. A special bulb is supplied, carrying a helical major filament, closely wound and $7/32$ in. in length. The former is especially focused with a filament drawn back of the focal center of the reflector until the front end is at the focus. The top of the filament being at the focal center gives the direct beam required, while the remainder, being behind the center, gives the distribution of light from the sides of the lamp for diffused illumination.

Standard adjusting directions have been supplied to all dealers. A shop layout for focusing and aligning the lamps is shown in Fig. 8. The empty car is put on a level surface in front of a white wall or screen at a distance of 25 ft. The wall must be in semi-darkness or shielded from direct light sufficiently so that the light spots upon it from the headlights are clearly defined. The bright lights are turned on and the lamps focused by means of the set screw at the back of the lamps, first one lamp and then the other, drawing the bulb filament slightly back of the focal center of the reflector or until a semi-circular spot of light is obtained on the wall, with the flat side up and with a concentrated circular central position.

In focusing, draw back the bulb to obtain as wide a spread as possible and still maintain the approximately flat top line and the concentrated central portion. In general, the spot of light when properly focused will be about 5 or 6

Mystery Tales

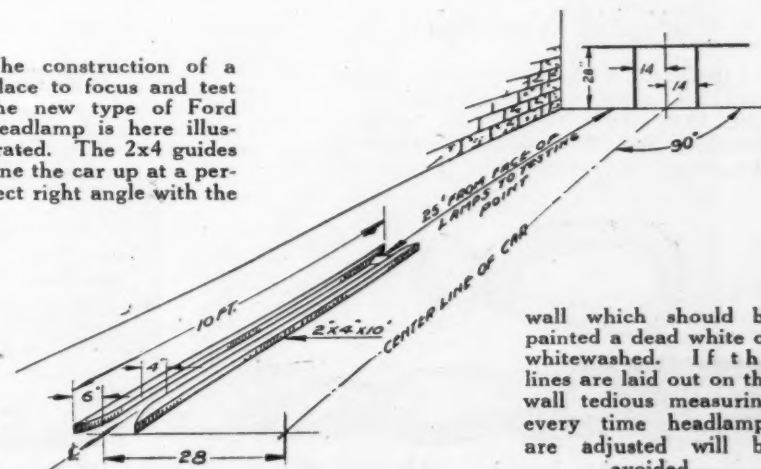
HAVE you ever had a little mystery in your shop? Most everybody has. For instance, one reader called up the editor and asked why the small pin through the top of the distributor shaft which drives the rotor brush of a well known make of high tension distributor, keeps breaking. He has used six, the last one of which was especially made of tool steel and case hardened. As this part bears no strain the breakage constitutes a mystery. The solution of it may be found by some clever mechanic in Bangor, Talchasse, Walla Walla or Okmulgee. When it is found, the finder will please oblige us with an elucidation.

There are thousands of these inexplicable mysteries (which, by the way, are usually very easily explained) developing daily, and it is the purpose of the "Mystery Tales" column to draw them out. If you are hiding a dark secret which is slowly but surely souring your disposition, sapping your vitality and ruining your life, drag the pesky thing out into the sunlight and let everybody take a look at it. Perhaps somebody in the crowd has a club up his sleeve in the form of a correct, or at least a plausible explanation, which will lay the thing low and save your sacred reputation. Or, perhaps you have the weapon which may preserve the sanity of some other sufferer. Now, altogether! Send in your mysteries and solutions!

ft. in diameter, as measured across the top.

In aligning the headlights, the headlamp brackets are bent so that the top lines of the bright spots on the 25 ft. wall are set at a line 28 in. above the level of the surface on which the car stands. The half cone of light from each headlamp is to extend straight forward; that is, the centers of the concentrated circular portions must be 28 in. apart.

The construction of a place to focus and test the new type of Ford headlamp is here illustrated. The 2x4 guides line the car up at a perfect right angle with the



wall which should be painted a dead white or whitewashed. If the lines are laid out on the wall tedious measuring every time headlights are adjusted will be avoided

"Mystery Tale"

Generator Tests Clear on Bench But Fails in Car

Here is a "Mystery Tale" of some electrical trouble which we encountered on a 1917 Apperson Jack Rabbit. The generator had been removed for repairs and after reassembling had been thoroughly tested on the test bench and found to be all right, the charging rate being about 12 amp. When the generator was installed on the car, however, it charged but failed to show more than 2 amp. on the meter. This led us to believe that the meter might be at fault, and so another was connected in the circuit, with the same results.

The battery was then checked to see if it was up to proper voltage and not sulphated, and was found to be all right, its good condition also being indicated by the fact that it turned the starter satisfactorily. The direction of rotation was then checked and found to be the same that had been used when testing on the bench. When all the electrical possibilities had been exhausted we began to inspect the method of drive and observed that there was a possibility of a slipping belt, as the installation on this particular car is such that a broad canvas belt drives both the generator and the fan. The belt was apparently tight enough but the surface appeared glazed, so a rough test was made by feeling the breeze from the fan as the engine was run at various speeds. The draught of air did not seem to increase in volume above a certain speed; we, therefore, applied some belt dressing and the trouble was immediately overcome—P. R. Electric Starter Co., Chicago.

MARION-HANDLEY TRANSMISSION PART

Q—What transmission was used in the Marion-Handley Six and where can we procure parts for it?—Donald McKinny, Bartlesville, Okla.

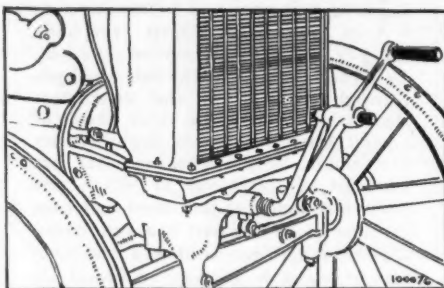
The Muncie transmission manufactured by the Muncie Gear Works, Muncie, Ind., was used in this car. The parts may be procured from the Auto Salvage & Exchange, Des Moines, Ia., Dayton Auto Parts Co., 1777 Broadway, New York, or Auto Gear & Parts Co., Atlanta, Ga.

The Accessory Show Case

New Fitments for the Car

Extension Starting Crank Increases Leverage

Cranking the Fordson tractor or Ford car is made easier by means of the Starting Crank Extension manufactured by the Frank R. Danielson Mfg. Co., Fairfield, Ia. Designed to give six inches additional leverage, the new fitting is not permanently attached to the stock crank but simply slips on over the latter and locks firmly thereto by means of a backwardly extending, curved lip. It is said to be invaluable when cranking a newly overhauled tractor engine or one in which the oil has congealed from cold. Priced at \$1.85, the extension may be procured from the manufacturer or from the Herring Motor Co., distributor, Des Moines, Ia.



Danielson starting crank extension

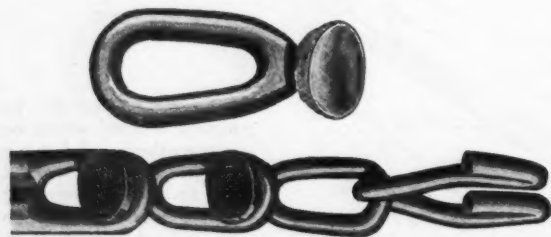
mier model is fitted with an aluminum cup and collar and also has an aluminum topped double cork. An attractive carrying bail is solidly attached to the fabrikoid jacket, which is enameled in a rich battleship gray. The Therm-a-Jug is made in two styles, the Premier and DeLuxe, and only in the one gallon or sixteen cup size.

New Chain Has Interchangeable Cross Links

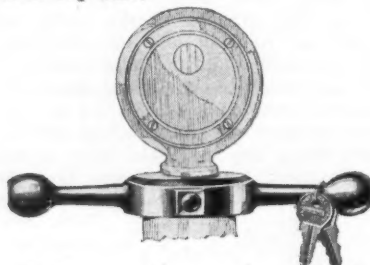
The outstanding feature of a new non-skid chain recently placed on the market by the Hodges Chain Co., 2721 S. Michigan Ave., Chicago, is that each of the individual links of the cross chains are quickly replaced when they become worn, thus eliminating the necessity of replacing the whole part. The links are drop forgings hardened and tempered and are for these reasons exceptionally long wearing. Formed like the conventional link on one end, the new link differs in that the other extremity ends in a large button shaped head which not only secures it to its mating link, but also presents a large traction surface to the roadway. It is claimed that the very hard links will outwear other devices of a similar nature and that when worn they can be quickly replaced without the use of tools.

Therm-a-Jug, a Motor Picnic Necessity

Liquid or solid refreshments can be kept hot or cold for long periods when placed in the Therm-a-Jug, manufactured by the Therm-a-Jug Company of America, Inc., Webster City, Ia. The Pre-



New chain has interchangeable cross links



Red spot radiator and cap block

E-Z Pedal

A device which is calculated to add to the joys of motoring is the E-Z pedal, manufactured by the Henderson-Cloud Co., 1028 South Grand Ave., Los Angeles, Cal. The E-Z pedal is equipped with a flat tension spring on the bottom which supports the weight of the foot, relieving the strain on the ankle and the muscles of the leg. It is claimed for the contrivance that it will eliminate the jerky motion on the accelerator and increase mileage by insuring a steady, even, consistent flow of mixture to the engine.



Therm-a-Jug

New Motor-Meter Lock Prevents Theft

A useful article of motor car equipment recently placed on the market is the Red Spot Radiator and Cap Lock, offered by the W. A. Hanna Co., Chicago. The new device is exceptionally well made of solid nickel silver which will not rust or corrode and takes a high polish. It is of the highest grade cylinder lock type with keyhole in one end of the graceful bar. The bar is locked and held in perfect alignment crosswise of the car by a quarter turn of the key, and upon being unlocked removes the cap by a one-quarter turn. It is claimed that the method of attachment is simple but that once having been installed and locked, removal is practically impossible.

Oversize Battery for Fords

Designed to enter the Ford replacement field, which has been estimated at 3,000 batteries a day, the "Ford Special," built by the Westinghouse Union Battery Co., Swissvale, Penna., is claimed to possess many points of superiority and excellence.

As its name implies, the battery is made especially for Ford automobiles. The manufacturers have made their objective the most efficient and economical battery that can be produced for Ford users. One of the advantages of the Ford Special is the use of 13 plates per cell instead of the conventional 11 plates, thereby giving greater opportunity for the play of the electrolyte through the active material in charging and discharging and thus giving higher capacities and discharge rate.

Ford Specials are handled by the regular Westinghouse battery distributors and branch service stations. They are being produced in quantity at the Swissvale plant. A zone system of prices has been adopted. These range from \$25 in the east to \$27.50 on the Pacific coast.



Henderson-Cloud E-Z pedal

Weeks "Camel" Auxiliary Water Tank

That it is practically impossible to overheat a motor protected by the Weeks "Camel" auxiliary circulation system, is one of the claims made by the manufacturers, the Weeks Mfg. Co., 421 National Avenue, Milwaukee, Wis. The units of the device are simple, consisting of an auxiliary water tank, a valve inbuilt into the radiator filler cap and a few feet of tubing between the radiator, the auxiliary tank and the engine intake manifold.

The theory of operation is that should the cooling water boil, instead of being forced out of the overflow pipe it will simply flow into the auxiliary tank. When the water in the radiator falls to such a level that the radiator cap valve is opened, intake manifold vacuum draws the overflow water from the auxiliary tank back into the radiator. Another claim made for the apparatus is that it serves as a decarbonizer, a small amount of moist air and steam being drawn from the radiator constantly.

Signa-Lite Safety Signal

The "Signa-Lite" safety signal manufactured by the Auto Safety Signal Co., of Rochester, N. Y., indicates the intention of the driver by flashing the word STOP in boldfaced letters or by means of arrows pointing to the right or left, as the occasion may demand. The new signal is so made that the bulb which lights the intention indicator also illumines the number plate and the red tail-light lens.

The Whirl-Wind Tire Pump

The evolution of the "Whirl-Wind" Tire pump makes it possible for the Ford owner to have another of the conveniences heretofore found only on the larger, more expensive cars. The pump is so designed that it is easily attached to the Ford fan bracket just to the rear of the fan. The active elements consist of the pump and a large friction wheel which is brought in contact with the fan belt to effect the drive. The entire



Rie Nie Vee-round belts

device is not left on the engine permanently but only the bracket is permanently installed. As this is held down securely by nuts it cannot rattle.

The pump and tubing are carried in the tool box or underneath the rear seat and it is but the work of an instant to snap them into place and connect the small spring which holds the friction wheel in contact with the belt. The pump is of the rotary type and the claim is made for it that it cannot score and that it will pump up a Ford tire to the required pressure in about five minutes. The complete outfit, listing at \$10, is sold by the Rotary Sales Organization, 1020 Wrigley Bldg., Chicago.



Rajah safety nipple

Rajah Safety Nipple

Rajah safety nipples designed to be applied to spark plugs and coil connection, are warranted to keep these parts dry and to prevent disagreeable shock. They are made of an insulating material of high quality. These well designed little contrivances, selling for 15 cents are marketed by the Rajah Auto Supply Co., Madison avenue at 40th street, New York.

G. M. C. Grease is Novel Lubricant

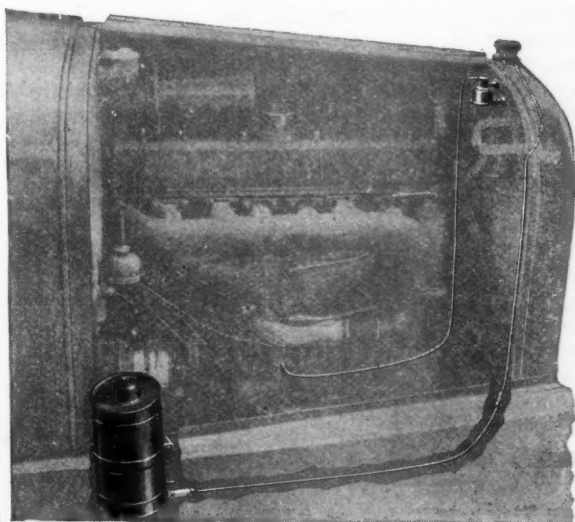
According to the manufacturers, the Gearo Manufacturing Co., Quincy, Ill., G. M. C. grease is something more than a conventional lubricant. Besides being a compound of high grade oils it is interblended with a metallic anti-friction composition which has the effect of forming glaze-like film between smooth metal surfaces and filling up the inequalities in those which have become cut or scored from insufficient lubrication. G. M. C. grease is recommended for transmissions, differentials, ball, roller and plain bearings and the like. According to the assertions made in its favor it will quickly cool a bearing which has become overheated and, once having been applied, prevents further friction and heat.

Rie Nie Vee-round Belts

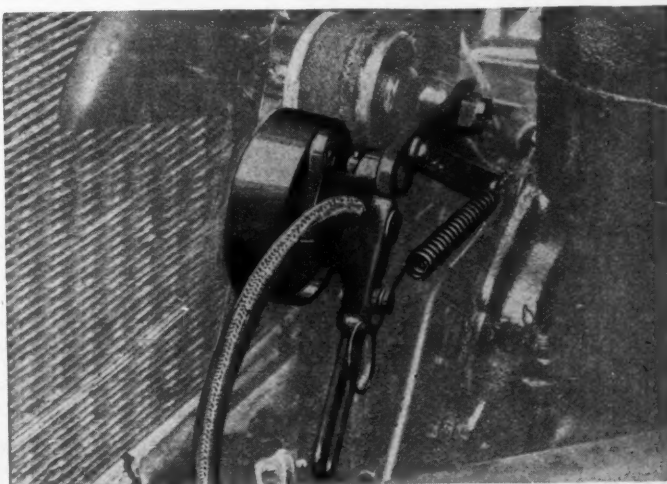
The Durkee-Atwood Co., Minneapolis, is the producer of great mechanical belts designed for fan or general drive. The new belt is semi-elastic in cross sections but non-stretching lengthwise, all the stretch being taken out at the time of manufacture. It is built up of several layers of rubber frictioned fabric and is claimed to be heat and oil proof. It is also asserted that it is positive in action, there being no slippage when used on either flat, U or V shaped pulleys.

"Whiz" Products

Of the 98 "Whiz" automobile products marketed by the R. M. Hollingshead Co., Camden, N. J., "Whiz" Gear Grease, "Whiz" Auto Body Polish and "Whiz" Liquid Radiator Stop Leak, are claimed to be very efficient. The gear grease is said to be an exceptionally high grade lubricant which will not gum or run and which preserves the silence of transmission and axle gears by preventing wear. "Whiz" Auto Body Polish is claimed to remove the dull, smoky, blue case from varnish, prevent it from cracking, and produce a high, long lasting, bright and glossy luster.



Weeks "Camel" auxiliary water tank



The Whirl-Wind tire pump

Fan Belt Sizes and Types 1921 Trucks

Motor Age Maintenance Data Sheet No. 161

One of a series of weekly pages of information valuable to service men and dealers—save this page

Name of Model	Capacity or Rating	Type of Belt	Width of Belt	Length of Belt	Degree of Angle if Vee Type	Name of Model	Capacity or Rating	Type of Belt	Width of Belt	Length of Belt	Degree of Angle if Vee Type
Acason	1	Flat	1½	39¼	.....	Brockway, K-5	2½	K-4	.....	.....	.....
Acason	1½	Flat	1½	39¼	.....	Brockway, A-4	3½	L-4	.....	.....	.....
Acason	2½	Flat	1½	39¼	.....	Brockway, T	5	Flat	2	40⅞	.....
Acason	3½	Flat	1½	39¼	.....	Capitol, M	3½	Flat	2	39½	.....
Acason	5	Flat	1½	40	.....	Capitol, H-3½	2½	Flat	2	39½	.....
Acme, B	1	Vee	¾	38¾	60	Capitol, K-2½	2½	Flat	2	39½	.....
Acme, F	1½	Flat	1¼	40	.....	Capitol, G	1½	Flat	1¼	33	.....
Acme, A	2	Vee	¾	33¾	60	Champion	1½	Flat	1	16	.....
Acme, C	3½	Flat	1¼	33½	.....	Case, JI, 2	2	Flat	2	47⅞	.....
Acme, E	5	Flat	2	40½	.....	Chicago, C1½	1½	Flat	2	40	.....
Akron Multi Truck	20—100	Flat	2	35½	.....	Chicago, C2½	2½	Flat	2	40	.....
Apex, G-1	1	Flat	⅞	32	.....	Chicago, C3½	3½	Flat	2	46	.....
Apex, D1½	1½	Flat	⅞	36½	.....	Chicago, D5	5	Flat	2	46	.....
Apex, E2½	2½	Flat	1	32	.....	Clydesdale, 32C	1	Flat	1½	43	.....
Apex, F3½	3½	Flat	2	39	.....	Clydesdale, 42C	1½	Flat	1½	43	.....
American, 40	4	Flat	2	38	.....	Clydesdale, 65C	2½	Flat	1½	48½	.....
American, 25	2½	Flat	2	38	.....	Clydesdale, 90C	3½	Flat	1½	48½	.....
Armleder, 20	1	Flat	2	31¾	.....	Clydesdale, 120C	5	Flat	2	46½	.....
Armleder, Cout. HW	2½	Flat	1¼	35	.....	Collier, 18	1	Flat	1	39½	.....
Armleder, Buda, HW	2½	Flat	2	34	.....	Collier, 19	1½	Flat	1	39½	.....
Armleder, KW	3½	Flat	2	36	.....	Collier, 20	2	Flat	1	36½	.....
Atco, A	2½	Flat	1¼	35¾	.....	Collier, 22	2½	Flat	1	36½	.....
Atco, B and B1	1½	Flat	2	31⅞	.....	Commerce, E	1	Vee	¾	44	60
Atterbury, 20R	1½	Flat	1¼	38 11/16	.....	Commerce, EP	1½	Vee	¾	44	60
Atterbury, 7R	1½	Flat	1¼	30¼	.....	Commerce, T	¾—1¼	Vee	¾	44	60
Atterbury, 7CX	2½	Flat	1¼	30¼	.....	Concord, A	1½	Flat	2	34½	.....
Atterbury, 7D	3½	Flat	1¼	30¼	.....	Concord, B	2½	Flat	2	34½	.....
Atterbury, 8E	5	Flat	2	41	.....	Corbitt, AA	5	Flat	2	41	.....
Atlas	No fan belt equipment					Corbitt, A	3½	Flat	1¼	39	.....
Autocar, XXWY	3½	Flat	1½	48¾	.....	Corbitt, B	2½	Flat	1¼	36	.....
Autocar, XXV1B	3½	Flat	1½	48¾	.....	Corbitt, C	2	Flat	1¼	36	.....
Autocar, F	2	No belt used				Corbitt, D	1½	Vee	⅝	38	60
Autocar, G	2	No belt used				Corbitt, E	1	Vee	⅝	38	60
Available, H1½	1½	Flat	2	40	.....	Day-Elder, A	1 —1½	Vee	⅝	40	60
Available, H2½	2½	Flat	2	40	.....	Day-Elder, B	1½—2	Vee	⅝	40	60
Available, H3½	3½	Flat	2	42½	.....	Day-Elder, D	2 —2½	Vee	⅝	35	60
Available, H5	5	Flat	2	40⅞	.....	Day-Elder, C	2½—3	Flat	2	36¾	.....
Available, H7	7	Flat	2	40⅞	.....	Day-Elder, F	3½—4	Flat	1½	35¼	.....
Avery	1	Flat	1½	31¾	.....	Day-Elder, E	5/6	Flat	1½	38½	.....
Bessemer, G	1	Vee	⅝	42	.....	Defiance, D	1½	Flat	1¼	40¾	.....
Bessemer, H2	1½	Vee	⅝	43	.....	Defiance, E	2	Flat	1¼	40¾	.....
Bessemer, J2	2½	Flat	1¼	36¼	.....	Dependable, C	1½	Flat	2	37½	.....
Bessemer, K2	4	Flat	1½	39¾	.....	Dependable, D	2	Flat	2	37½	.....
Bethlehem, K	1	Flat	1¼	35¼	.....	Dependable, E	2½	Flat	2	37½	.....
Bethlehem, G	2	Flat	1½	40⅞	.....	Diamond, T	1½	Flat	2	35	.....
Bethlehem, H	3	Flat	1½	40⅞	.....	Diamond, T	1½	Flat	2	35	.....
Bethlehem, J	4	Flat	1¾	41½	.....	Diamond, T	2	Flat	2	35	.....
Betz	2½	Flat	1	33	.....	Diamond, T	3½	Flat	2	35	.....
Bollstrom, B21	4	Flat	2	42	.....	Diamond, T	5	Flat	2	35	.....
Bridgeport, A	1½	Flat	1	38¾	.....	Diamond, T5	5	Flat	2	40¾	.....
Bridgeport, B	2½	Flat	2	35	.....	Doane, 2½	2½	Flat	1½	32	.....
Bridgeport, C	4	Flat	2	36	.....	Doane, 3½	3½	Flat	1½	38¾	.....
Bridgeport, D	6	Flat	2	36	.....	Doane, 6	6	Flat	1½	43	.....
Brinton, F	2½—3	Flat	11/16	31½	.....	Doane, 6T	6	Flat	1½	39	.....
Briscoe, T-34	18 1/5	Flat	1	34¼	.....	Dodge Brothers	½	Glat	1	22	.....
Brockway, S-4	1½	S-4	.....	.....	.....	Dorris, K-4	2½	Flat	2	42 2/3	.....

Automotive Repair Shop

Practical Maintenance Hints

Engine Cylinder Gages for Fitting Pistons

A simple form of gage which is useful in determining the necessity for over-size pistons in the cylinders of an engine, is made from drill rod, $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in diameter. The lengths of these gages are made to correspond to the various piston sizes. For example, the Ford uses a $3\frac{3}{4}$ in. piston. The first over-size is .0025 in. and the second over-size .03125 in. after the cylinder has been rebored. Every mechanic does not possess an inside micrometer and the expense of one is often prohibitive.

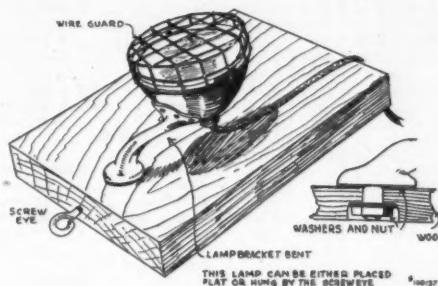
These gages are comparatively inexpensive and last for a long period. The rod is cut off, the ends are tapered and hardened, then finished up to length using an outside micrometer. With the cylinder head removed, the mechanic inserts these gages into the cylinder above the piston. This simple inspection will show the need of an over-size piston or will indicate whether or not the cylinders have been rebored.

If a standard piston is in the cylinder and the .0025 in. gage enters without binding, renewal of the pistons is essential. This is simple for the owner to understand and practically no argument is required on the part of the mechanic in convincing him that they must be installed.

A set of sizes for the different makes costs but the time and effort to make them up, and this cost is rapidly repaid by the satisfactory service they render.

Headlamp Makes Efficient Working Light

A night lamp to facilitate the work of repairing automobiles after dark is readily made, using an old headlight containing a silvered reflector and a medium candle power bulb in conjunction with the storage battery of the car. It is mounted on a wood back board and secured by means of a nut. Over the



Headlamp makes efficient working light

Cooperation

COOPERATION is the keynote of the automotive industry this year and will become more important as time goes on. Motor Age is pleased to extend an invitation to its readers, wherever they may be, to contribute short articles and sketches on easy or improved ways of doing hard things, which they may have worked out and thus lend their aid in **HELPING THE OTHER FELLOW**. Correspondence among contributors is also strongly urged. Let's get together and make this a happy family with one end in view, that of hearty, unselfish COOPERATION.

face of the headlight glass, a piece of guard wire is fitted to prevent breakage. On one edge of the wood back board a heavy screw eye is placed to hang the fixture over a nail as required. For under car work the fixture is simply placed flat. The concentrated beam of light is superior to the usual open light and even the work of fitting bearings inside the motor can be carried out with the help of this light to illuminate the parts clearly.

Work Rest for Bench Vise, from "C" Clamp

A "C" clamp with a riveted on extension affords a substantial rest for shafts or bars held at one end in the vise while filing, sawing or chiseling. This attachment as is shown in the sketch herewith is simply held to the edge of the bench by means of the thumb screw and is removable when it is not needed. The riveted extension does not necessarily interfere with the use of the clamp when it is used for other purposes.

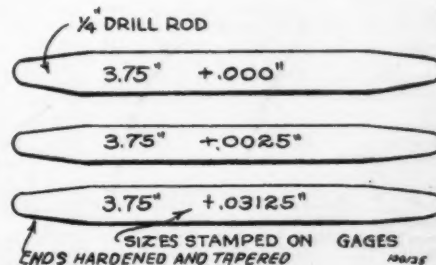
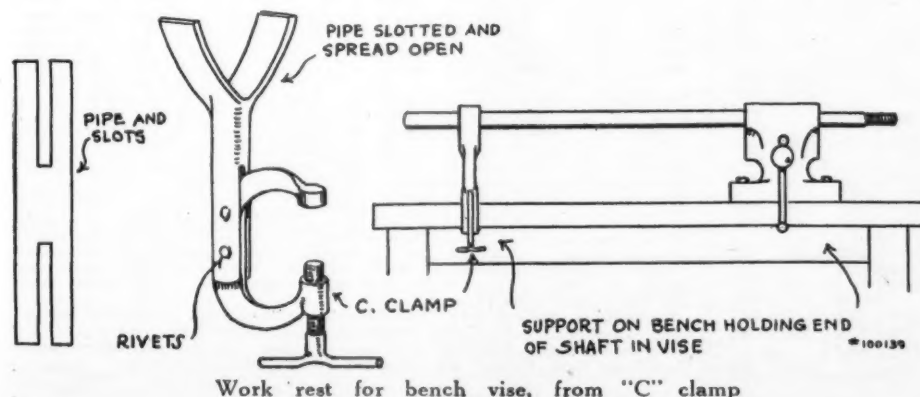
Service?

The "Safety First" sign still needs hanging out in some garages and repair-shops. Mr. W. Landreville, funeral director, Ottawa, found that his tank leaked and the garage next door was a convenient place to get it fixed. The fixing was started by George Hope, automobile mechanic, who proceeded to locate the leak with a match. Results were at once secured, and the city fire brigade had a quick run as well as the chief and deputy chief. It will take about \$500 to get back to where the match started and then a little more for salve for the burns which George received.

ROUGH AND READY METHOD OF BETTERING SPRING ACTION

Rusty hard riding springs can be quickly improved by plastering them along their sides and bottoms with a liberal coat of graphite grease. Although a messy job, it is very effective, as the oil in the grease seeps in between the leaves and, carrying the graphite with it, quickly lubricates the whole spring. After the spring action is restored to something like normal, the grease may be cleaned off.

The lubricating effect will last for weeks for the reason that the graphite working into the hundreds of pits caused by the rust converts these into very good receptacles from which it redistributes later.



Engine cylinder gages for fitting pistons

Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ace.....G	Guy	6-3 1/2 x 5	123	32x4	\$2975	\$2975		\$3680	\$3680
Ace.....H	H-S	6-3 1/2 x 5	123	32x4	2975	2975		3680	3680
Ace.....L	H-S	4-3 1/2 x 5	116	32x4	2260	2260			
Allen.....Series 43	Ow.	4-3 1/2 x 5	110	22x4	1385	1385		2195	
Ambassador.....R	Cont.	6-3 1/2 x 5 1/2	136	33x5	14500	14500		6500	
American.....C	H-S	6-3 1/2 x 5	127	32x4	2195	2275	2350	3150	
Anderson.....Series 40	Ow.	6-3 1/2 x 4 1/2	120	33x4	2195	1705	1845	2795	2795
Apperson.....8-21-S	Ow.	8-3 1/2 x 5	130	34x4 1/2		3000	3250	4500	4500
Apperson.....Anniversary	Ow.	8-3 1/2 x 5	130	34x4 1/2		3500	3750		
Auburn.....6-39	Cont.	6-3 1/2 x 4 1/2	120	32x4		1695	1695	2795	2795
Beggs.....20T	Cont.	6-3 1/2 x 4 1/2	120	33x4	1775	1775		2675	2775
Bell.....4-32	H-S	4-3 1/2 x 5	114	31x4		1495			
Bell.....6-50	H-S	6-3 1/2 x 5	124	32x4		1695			
Biddle.....81	Buda	4-3 1/2 x 5 1/2	121	32x4	3475	3475		3975	
Birch Super-Four	H-S	4-3 1/2 x 5 1/2	117	33x4	1345	1345	1395	2295	2295
Birch Light Six	LeR	6-3 1/2 x 5 1/2	108	30x3 1/2	1195	1195			
Birch Light Six	H-S	6-3 1/2 x 5	117	33x4	1595	1595			
Bour-Davis.....21S	Cont.	6-3 1/2 x 5 1/2	126	33x4 1/2	2385	2385	2385		
Brewster.....91	Ow.	4-4 x 5 1/2	109	31x4	1085	1085		1685	1685
Briscoe.....4-34	Ow.	4-3 1/2 x 5	109	31x4	885	885			
Brook.....S-21 A	Ow.	2-3 1/2 x 5 1/2	90	28x3	395				
Buick.....1922-41-5-6-7	Ow.	6-3 1/2 x 4 1/2	118	33x4 1/2	1495	1525		2135	2435
Buick.....1922-48-9-50	Ow.	6-3 1/2 x 4 1/2	124	34x4 1/2			1735	2325	2635
Bush.....E.C.4	Lyc.	4-3 1/2 x 5	116	33x4		1195			
Bush.....E.C.6	Rut.	6-3 1/2 x 5	116	33x4		1345		1750	1850
Cadillac.....59	Ow.	8-3 1/2 x 5 1/2	132	35x5			3940		5190
Carroll.....C	Roeh.	6-3 1/2 x 5	128		3985	3985			
Carroll.....D	Roeh.	6-3 1/2 x 5	128		3185	3185			
Case.....V	Cont.	6-3 1/2 x 5 1/2	126	34x4 1/2		2250	2250	2900	3285
Chalmers.....6-30	Ow.	6-3 1/2 x 4 1/2	117	32x4	1495	1545		2295	2445
Chalmers.....6-30	Ow.	6-3 1/2 x 4 1/2	122	33x4 1/2			1795		
Champion.....Tourist	Lyc.	4-3 1/2 x 5	113	32x3 1/2		1095			
Champion.....Special	H-S	4-3 1/2 x 5	118	32x4	1395	1395			
Chandler.....Six	Ow.	6-3 1/2 x 5	123	33x4	1785	1785	2785	2885	
Chevrolet.....490	Ow.	4-3 1/2 x 4	102	30x3 1/2	625	625	975	975	
Chevrolet.....FB	Ow.	4-3 1/2 x 4 1/2	110	33x4	975	975	1575	1575	
Cleveland.....40	Ow.	6-3 x 4 1/2	112	32x4	1245	1295	2195	2295	
Climber Four	H-S	4-3 1/2 x 5	117		1450	1385			
Climber Six	H-S	6-3 1/2 x 5	125 1/2	32x4 1/2	2250	2250			
Cole.....870	Nort.	8-3 1/2 x 4 1/2	127	33x5	2550	2695	2795	3695	3995
Columbia Challenger	Rut.	6-3 1/2 x 5	115	32x4		1495			
Columbia Challenger	Cont.	6-3 1/2 x 4 1/2	115	32x4	1795	1795		2495	2595
Comet.....C-53	Cont.	6-3 1/2 x 5 1/2	125	33x4 1/2		2350	2450	3650	
Commonwealth.....44	H-S	4-3 1/2 x 5	117	32x4		1395		2465	
Crawford.....21-6-40	Cont.	6-3 1/2 x 5 1/2	122 1/2	32x4	3000	3000		4500	
Crow-Elkhart.....L-63-65	Lyc.	4-3 1/2 x 5	117	32x3 1/2	1295	1295			
Crow-Elkhart.....S-63-65	H-S	6-3 1/2 x 5	117	33x4	1545	1545		2395	
Daniels.....D-19	Ow.	8-3 1/2 x 5 1/2	132	34x4 1/2	5350	5350	6250	6950	
Davis.....61-67	Cont.	4-3 1/2 x 4 1/2	120	33x4	1995	1895	2150	2795	2795
Dispatch.....H-S-70	Ow.	6-3 1/2 x 5	120	31x4	1250	1350	1525	1575	
Dispatch.....H-S-70	Ow.	4-3 1/2 x 5	112	32x4	1445	1445	2295	2345	
Dodge Brothers.....6-80	Ow.	4-3 1/2 x 4 1/2	114	32x4	935	985	1585	1785	
Dorris.....17-12	Ow.	6-4 x 5	132	33x5		14785	4785	5800	6690
Dort.....17-12	D-Ly	4-3 1/2 x 5	108	31x4	985	985	1535	1685	
Dupont.....A	Ow.	4-3 1/2 x 5 1/2	124	32x4 1/2	3400	3400		4900	
Elcar.....K-4	Lyc.	4-3 1/2 x 5	117	33x4	1195	1195			
Elcar.....7-R	Cont.	6-3 1/2 x 4 1/2	117	33x4	1595	1595	1195	2395	2495
Elgin.....K-1	Falls.	6-3 1/2 x 4 1/2	118	33x4	1595	1495	1595	2395	2395
Essex.....S-5-21	Ow.	4-3 1/2 x 5	108 1/2	32x4	1445	1445		1950	2300
Fergus.....S-5-21	Ow.	6-3 1/2 x 5	126	33x4 1/2		Chassis Price	8500		
Ferris.....Cont.	Ow.	6-3 1/2 x 5 1/2	130	32x4 1/2	3350		2595	3675	
Ford.....T	Ow.	4-3 1/2 x 4	100	30x3 1/2	**370	1415		605	760
Franklin.....9-B	Ow.	6-3 1/2 x 4	115	32x4	2550	2650	2550	3650	
Friend.....Four	Ow.	4-3 1/2 x 4 1/2	112	32x3 1/2	1285			1985	2085
Gardner.....G	Lyc.	4-3 1/2 x 5	112	32x3 1/2	1995	1995		1795	
Globe.....B-10	Supr.	4-3 1/2 x 5	115	32x4					
Grant.....Six	Ow.	6-3 1/2 x 4 1/2	116	32x4	1550	1550		2450	2450
H.C.S.....Weid.	4-3 1/2 x 5 1/2	120	32x4 1/2	2025	1975		3650	3850	
Halladay, Manh. Special	Rut.	6-3 1/2 x 5	118	33x4		1695			
Halladay, Craft Special	Rut.	6-3 1/2 x 5	123	33x4		2295			
Handley-Knight.....Kn't	4-4 1/2 x 4 1/2	125	32x4 1/2			2850		4185	
Hanson Six.....60	Ow.	6-3 1/2 x 4 1/2	121	32x4	2185	2185	2285		3165
Hanover Light.....A-A-2	Ow.	2-3 1/2 x 4	190	28x3	345				
Harroun.....A-42	Ow.	4-3 1/2 x 5 1/2	106	30x3 1/2		1195			
Hatfield.....A-42	H-S	4-3 1/2 x 5	115	32x4	1495	1495		2395	
Haynes.....55	Ow.	6-3 1/2 x 5	132	34x4 1/2	2685	2485	2485	3185	3485
Haynes.....48	Ow.	6-3 1/2 x 5	121	33x4	1835	1785		2835	
Holmes.....Series 4	Ow.	12-2 1/2 x 5	121	34x4 1/2	4200	3635	3635	4650	4950
Hudson Super 6.....R	Ow.	6-3 1/2 x 5	126	34x4 1/2	2250		2950	3850	4150
Huffman.....R	Cont.	6-3 1/2 x 4 1/2	120	32x4	1845	1795		2775	
Hupmobile.....Series R	Ow.	4-3 1/2 x 5 1/2	112	32x4	1485	1485		2400	2485
Jackson.....638	Cont.	6-3 1/2 x 4 1/2	121	32x4 1/2	2685	1950		3760	3760
Jordan.....M	Cont.	6-3 1/2 x 4 1/2	120	32x4	2250	2250		3300	3300
Jordan.....F	Cont.	6-3 1/2 x 5 1/2	127	32x4 1/2				2475	3700
Kenworthy.....8-90	Ow.	8-3 x 5 1/2	130	32x4 1/2	5000	5000	5250	6000	6000
Kessler.....K	Ow.	4-3 1/2 x 3 1/2	117	32x4		1995		2445	
King.....J	Ow.	8-3 x 5	120	32x4 1/2	2740	2725	2725	4035	
Kissel.....45	Ow.	6-3 1/2 x 5 1/2	124	32x4 1/2	2775	2795	2475	3775	
Kline Kar.....6-55-K	Cont.	6-3 1/2 x 4	121	33x4	2090	2090	3250	3290	
Kurtz Automatic.....A	H-S	6-3 1/2 x 5	122	32x4		2050		3000	
LaFayette.....134	Ow.	8-3 1/2 x 5 1/2	132	33x5	4850	4850	6250	6500	
Leach.....21-A-B-C	Cont.	6-3 1/2 x 5 1/2	128	32x4 1/2	5700	5200	5700		
Lexington.....Series S	Cont.	6-3 1/2 x 4 1/2	122	32x4		1885		2750	3150
Lexington.....Series T	Arst.	6-3 1/2 x 4 1/2	128	32x4 1/2			2785		4150
Liberty.....10-C	Ow.	6-3 1/2 x 5	117	32x4	1395	1595	1675	2400	2495
Lincoln.....Ow.	8-3 1/2 x 5	130	33x5	4300	4300	4300	4300	5400	
Locomobile.....Ow.	6-4 1/2 x 5 1/2	112	35x5		18600	8600			
Lorraine.....21-T	H-S	4-3 1/2 x 5	114	32x4	1665	1665		2590	2590
Maibohm.....B	Falls.	6-3 1/2 x 4 1/2	116	32x4	11575	11575	11750	2395	2395
Marmon.....34	Ow.	6-3 1/2 x 5 1/2	136	32x4 1/2	4185	3985	3985	4875	5275
Maxwell.....25	Ow.	4-3 1/2 x 6	109	30x3 1/2	845	845		1445	1545
McFarlan.....1921	Ow.	6-4 1/2 x 6	140	33x5	6300	6300	6300	7500	7500
Mercer.....Series 5	Ow.	4-3 1/2 x 6 1/2	132	32x4 1/2	4500	4500	4500	5700	6200
Merit.....Cont.	6-3 1/2 x 4 1/2	119	32x4	2245	2245				
Meteor.....R & RR	Dues.	4-4 1/2 x 6	129	32x4 1/2	5500	5500			
Metz.....M6	Rut.	6-3 1/2 x 5	120	32x4	1995	1995		2795	2895
Mitchell.....F-40	Ow.	6-3 1/2 x 5	120	33x4	1490	1490		2590	2690
Mitchell.....F-42	Ow.	6-3 1/2 x 5	127	33x4		1795			
Moller.....A	Ow.	4-2 1/2 x 4	100	27x3 1/2	2000				
Monroe.....S-9 & 10	Ow.	4-3 1/2 x 4 1/2	115	32x3 1/2	1295	1295			
Monroe.....S-11 & 12	Ow.	4-3 1/2 x 4 1/2	115	35x4				2075	2175
Moon.....6-48	Cont.	6-3 1/2 x 4 1/2	122	32x4	2085	1985	2485	2985	2985
Murray-Mac Six.....Ow.	6-3 1/2 x 5 1/2	128	34x4 1/2	4250	4250	4250			
Nash.....681-7	Ow.	6-3 1/2 x 5	121	33x4	1525	1545	1695	2395	2695
Nash.....682	Ow.	6-3 1/2 x 5	127	34x4 1/2		1695			
Nash Four.....41-A	Ow.	4-3 1/2 x 5	112	32x3 1/2	1175	1195		1735	1935
National Sixtet.....BB	Ow.	6-3 1/2 x 5 1/2	130	32x4 1/2	2990	2990	2990	3990	3990
Nelson.....D	Ow.	4-3 1/2 x 4 1/2	104	32x4		1900			
Noma.....1C	Cont.	6-3 1/2 x 4 1/2	128	32x4 1/2	3000	3200		4450	
Northway.....Ow.	6-3 1/2 x 5 1/2	128	33x5	4200		6000	5600	5400	
Norwalk.....430-KS	Lyc.	4-3 1/2 x 5	116	32x3 1/2		1035			
Oakland.....34-C	Ow.	6-2 1/2 x 4 1/2	115	32x4	1095	1145		1625	1725
Ogren.....6-60	Ow.	6-3 1/2 x 5 1/2	134	33x5	3850	3750	3900	5000	5100
Oldsmobile.....43-A	Ow.	4-3 1/2 x 5 1/2	115	32x4	1325	1345		1895	2100
Oldsmobile.....37A	Ow.	6-2 1/2 x 4 1/2	112	32x4	1450	1450		2145	2145
Oldsmobile.....46	Ow.	8-2 1/2 x 4 1/2	122	33x4 1/2		1825	1875	2775	
Oldsmobile.....47	Ow.	8-2 1/2 x 4 1/2	115	32x4		1725		2225	2425
Overland.....4	Ow.	4-3 1/2 x 4	100	30x3 1/2	695	695		1000	1275
Packard.....Single-Six	Ow.	6-3 1/2 x 4 1/2	116	33x4 1/2	2975	2975		3750	3975
Packard.....T									

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear						Front	Rear	
Acason	1	\$1650	3 1/2 x 5	34x5 1/2	34x5 1/2	W	Concord, BX	2 1/2	\$2600	4 1/2 x 5 1/2	36x4	36x8	W	Gary, I	1 1/2	\$2550	4 x 5 1/2	36x3 1/2	36x5	W
Acason, R	1 1/2	2260	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Cook, 41	2 1/2	3000	4 x 5 1/2	36x4 1/2	36x7 1/2	W	Gary, J	1 1/2	3150	4 1/2 x 5 1/2	36x4	36x7	W
Acason, RB	1 1/2	2485	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Corbit, E	1 1/2	2200	3 1/2 x 5	34x3 1/2	34x4	W	Gary, K	1 1/2	4050	4 1/2 x 5 1/2	36x5	40x5d	W
Acason, H	2 1/2	3295	4 1/2 x 5 1/2	36x4 1/2	36x5	W	Corbit, D	1 1/2	2600	3 1/2 x 5	36x3 1/2	36x5	W	Gary, M	1 1/2	5150	5 x 5 1/2	36x6	40x6d	W
Acason, L	3 1/2	4295	4 1/2 x 5 1/2	36x4 1/2	36x5	W	Corbit, C	2 1/2	3150	4 1/2 x 5 1/2	36x3 1/2	36x7	W	Gersix M	1 1/2	3100	4 x 5 1/2	36x3 1/2	36x7	W
Acason, M	5	5250	5 x 5 1/2	36x6	40x12	W	Corbit, B	2 1/2	3300	4 1/2 x 5 1/2	36x4	36x7	W	Gersix K	2 1/2	3500	4 1/2 x 5 1/2	36x4	36x8	W
Ace, C	1 1/2	2295	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Corbit, A	3 1/2	4100	4 1/2 x 5 1/2	36x5	36x10	W	Giant, 15-A	1 1/2	4500	4 1/2 x 5 1/2	36x5	40x12	W
Ace, A	2 1/2	2795	4 1/2 x 5 1/2	36x4 1/2	36x7	W	Cyclone	1 1/2	2500	3 1/2 x 5	34x5 1/2	34x6 1/2	W	Giant, 16	2	3150	4 1/2 x 5 1/2	36x4	36x7	W
Acme, G	1 1/2	.....	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Dart, S	1 1/2	.....	3 1/2 x 5 1/2	34x3 1/2	34x6	W	Giant, 17	3 1/2	4150	4 1/2 x 5 1/2	36x5	36x5d	W
Acme, B	1 1/2	.....	3 1/2 x 5	34x3 1/2	34x5	W	Dart, M	2 1/2	.....	4 1/2 x 5 1/2	36x4	36x7	W	Globe D-20	1 1/2	1495	3 1/2 x 5	33x4 1/2	33x4 1/2	B
Acme, F	2 1/2	.....	4 1/2 x 5 1/2	36x4	36x7	W	Day-Elder, A	1	2225	3 1/2 x 5	34x3 1/2	34x4	W	Globe	1	1495	3 1/2 x 5	33x5	33x5	B
Acme, A	2 1/2	.....	4 1/2 x 5 1/2	36x5	40x10	W	Day-Elder, B	1 1/2	2425	3 1/2 x 5	34x3 1/2	34x5	W	Golden West, GH	3 1/2	5000	4 1/2 x 5 1/2	36x7	36x7	W
Acme, C	3 1/2	.....	4 1/2 x 5 1/2	36x6	40x12	W	Day-Elder, D	2 1/2	2900	4 1/2 x 5 1/2	36x4	36x7	W	Golden West, G	3 1/2	4500	4 1/2 x 5 1/2	36x6	36x6	W
Acme, E	5	.....	4 1/2 x 5 1/2	36x6	40x12	W	Day-Elder, E	2 1/2	3125	4 1/2 x 5	36x4	36x7	W	Golden West, T	3 1/2	5090	4 1/2 x 5 1/2	36x6	36x6	W
Akr'n Multi-Trk-20	1	1995	4 x 5 1/2	36x4	36x5	W	Day-Elder, F	3 1/2	3950	4 1/2 x 5 1/2	36x5	36x5d	W	Golden West, K	4	5500	4 1/2 x 5 1/2	36x6	36x6	W
All-Power, C	1 1/2	1795	3 1/2 x 5	32x4	32x4	W	Day-Elder, E	5	4875	4 1/2 x 6	36x5	36x6d	W	Golden West, HA	7	6000	4 1/2 x 5 1/2	36x6	36x6	W
All-American C-1	1 1/2	2195	3 1/2 x 5	34x4	34x5	W	Dearborn, F	1 1/2	2180	3 1/2 x 5 1/2	34x4	34x5	W	Gove, A-1	2 1/2	2405	3 1/2 x 5	35x5 1/2	35x5 1/2	I
American, 25	2 1/2	3350	4 x 6	36x4	36x4d	W	Dearborn, 48	2	2590	3 1/2 x 5 1/2	35x5 1/2	35x7 1/2	W	Gramm-Bern, 10	1 1/2	1495	3 1/2 x 5	33x5 1/2	33x5 1/2	D
American, 40	4	4275	4 1/2 x 6	36x5	36x5d	W	Defiance, G	1 1/2	1975	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Gramm-Bern, 15	1 1/2	2050	3 1/2 x 5	36x3 1/2	36x5	I
Ape, G	1 1/2	1675	3 1/2 x 5	33x5 1/2	33x5 1/2	W	Defiance, E	2 1/2	2550	3 1/2 x 5	35x5 1/2	35x7 1/2	W	Gramm-Bern, 65	1 1/2	2725	3 1/2 x 5	36x3 1/2	36x5	W
Ape, D	1 1/2	1915	3 1/2 x 5 1/2	34x3 1/2	34x4	W	DeKalb, E2 1/2	2 1/2	2750	3 1/2 x 5	35x5 1/2	35x7 1/2	W	Gramm-Bern, 20	2	3175	4 1/2 x 5 1/2	36x4	36x7	W
Ape, E	2 1/2	2065	4 1/2 x 5 1/2	36x4	36x7	W	DeKalb, E2	2 1/2	2600	3 1/2 x 5 1/2	36x4	36x6	W	Gramm-Bern, 25	2 1/2	3575	4 1/2 x 5 1/2	36x4	36x7	W
Ape, F	3 1/2	3075	4 1/2 x 6	36x5	36x10	W	DeMartini 1 1/2	2 1/2	2250	3 1/2 x 5	34x3 1/2	34x6	W	Gramm-Bern, 35	3 1/2	4375	4 1/2 x 5 1/2	36x5	40x5d	W
Armleder, 20	1 1/2	.....	3 1/2 x 5 1/2	36x4 1/2	36x5	W	DeMartini 2	3	4250	4 1/2 x 5 1/2	36x4	36x10	W	Gramm-Bern, 50	5	5275	4 1/2 x 6	36x6	40x6d	W
Armleder, HW	2 1/2	.....	4 1/2 x 5 1/2	36x5	36x7	W	DeMartini 3	4	4800	4 1/2 x 6	36x5	36x12	W	Hahn, J4	1	.....	3 1/2 x 5	34x5	34x5	W
Armleder, KW	3 1/2	.....	4 1/2 x 5 1/2	36x5	36x5d	W	DeMartini 4	1 1/2	1625	3 1/2 x 5	35x5	35x6	W	Hahn, CD	1 1/2	.....	4 1/2 x 5 1/2	36x3 1/2	36x6	W
Atco, B	1 1/2	.....	3 1/2 x 5 1/2	34x5 1/2	36x6	W	Denby, 12	1 1/2	2300	3 1/2 x 5	35x5 1/2	35x7 1/2	W	Hahn, EE	2 1/2	.....	4 1/2 x 5 1/2	36x4	36x8	W
Atco, B1	1 1/2	.....	3 1/2 x 5 1/2	34x5 1/2	36x6	W	Denby, 13 1/2	2	2600	3 1/2 x 5	35x5 1/2	35x7 1/2	W	Hahn, EF	3 1/2	.....	4 1/2 x 5 1/2	36x5	36x10	W
Atco, A	2 1/2	.....	4 1/2 x 5 1/2	36x5	36x5d	W	Denby, 25	3	3300	4 1/2 x 5 1/2	36x4	36x7	W	Hal Fur, E	1	2350	4 x 5	35x5 1/2	35x5 1/2	W
Atlas, M.D	1	.....	3 1/2 x 5	32x4 1/2	32x4 1/2	W	Denby, 27	4	4200	4 1/2 x 5 1/2	36x5	36x5d	W	Hal Fur, F	1 1/2	2350	4 x 5	35x5 1/2	35x5 1/2	W
Atterbury, 20R	1 1/2	2775	3 1/2 x 5	34x3 1/2	34x5	W	Dependable, A	1 1/2	1650	3 1/2 x 5	34x5	36x6	W	Hall	1 1/2	3100	3 1/2 x 5	34x5 1/2	34x5 1/2	W
Atterbury, 7CX	2 1/2	3375	4 1/2 x 5 1/2	36x4	36x4d	W	Dependable, D	1 1/2	2350	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Hall	1 1/2	3275	4 1/2 x 5 1/2	36x5	36x6	W
Atterbury, 7D	3 1/2	4175	4 1/2 x 5 1/2	36x5	40x5d	W	Dependable, E	2 1/2	2650	4 1/2 x 5 1/2	36x4	36x7	W	Hall	3 1/2	4100	4 1/2 x 5 1/2	36x5	36x5d	W
Atterbury, 8E	5	5575	4 1/2 x 6	36x5	40x6d	W	Dependable, G	3 1/2	2950	4 1/2 x 5 1/2	36x4	36x7	W	Hall	5	5100	4 1/2 x 5 1/2	36x5	40x6d	W
Autocar, 21UF	1 1/2-2	2300	3 1/2 x 4 1/2	34x4	34x5	D	Dependable, O	1 1/2	3550	4 1/2 x 5 1/2	36x5	36x7	W	Harvey, WEA	1 1/2	2550	4 1/2 x 5 1/2	36x3 1/2	36x5	W
Autocar, 21UG	1 1/2-2	2400	3 1/2 x 4 1/2	34x4	34x5	D	Diamond-T, FS	1 1/2	2500	3 1/2 x 5 1/2	34x5 1/2	36x6 1/2	W	Harvey, WFA	2 1/2	3300	4 1/2 x 5 1/2	36x4	36x7	W
Autocar, 26Y	.....	4350	4 1/2 x 5 1/2	34x5	36x10	D	Diamond-T, I	1 1/2	2650	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Harvey, WHA	3 1/2	4300	4 1/2 x 5 1/2	36x5	36x5d	W
Autocar, 26-B	.....	4500	4 1/2 x 5 1/2	34x5	36x10	D	Diamond-T, U	2	3285	4 x 5 1/2	36x4	36x7	W	Harvey, WKA	5	5200	4 1/2 x 5 1/2	36x6	40x6d	W
Available, H1 1/2	1 1/2	2750	4 x 5 1/2	36x3 1/2	36x5	W	Diamond-T, EL	3 1/2	4675	4 1/2 x 5 1/2	36x5	36x5d	W	Hawkeye, K	1 1/2	1850	3 1/2 x 5 1/2	34x3 1/2	34x5	I
Available, H2 1/2	2 1/2	3475	4 x 5 1/2	36x4	36x8	W	Diamond-T, S	5	5650	4 1/2 x 6	36x6	40x6d	W	Hawkeye, M	2	2650	4 1/2 x 5 1/2	36x4	36x6	W
Available, H3 1/2	3 1/2	4475	4 1/2 x 5 1/2	36x5	40x5d	W	Diehl, A	1 1/2	.....	3 1/2 x 5	34x4 1/2	35x5	W	Hawkeye, N	3 1/2	3700	4 1/2 x 5 1/2	36x5	36x10	W
Available, H5	5	5375	4 1/2 x 6	36x6	40x12	W	Diehl, B	1 1/2	.....	3 1/2 x 5	34x4 1/2	35x5	W	Hendrickson, N	2 1/2	3150	4 1/2 x 5 1/2	36x4	36x7	W
Available, H7	7	6000	5 x 6	36x6	40x14	W	Dispatch, F	1	1350	3 1/2 x 5	36x6	36x6	W	Hendrickson, M	3 1/2	3975	4 1/2 x 5 1/2	36x5	36x5d	W
Avery	1	.....	3 x 4	34x5 1/2	34x5 1/2	I	Doane	2 1/2	4100	4 1/2 x 5 1/2	36x5	36x7	C	Highway Knight	5	.....	4 x 6	36x5	40x6d	W
Beck, A. Jr.	1 1/2	1800	3 1/2 x 5	36x4 1/2	36x4	I	Doane	6	6000	4 1/2 x 5 1/2	36x6	40x6d	C	Higra, A17	1 1/2	1850	3 1/2 x 5	32x4 1/2	32x4 1/2	W
Beck, C	2	2550	4 1/2 x 5 1/2	36x5	36x6	I	Dodge Brothers	1 1/2	1035	3 1/2 x 5 1/2	36x4	36x7	B	Higra, A18	1	2100	3 1/2 x 5	35x5 1/2	35x5 1/2	W
Beck, M	1 1/2	1650																		

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear						Front	Rear	
Kelly-S, K-15	4	\$4550	4 1/2 x 6 1/2	36x5	40x6 1/2	C	Ogden, A1	1 1/2	\$2550	3 1/2 x 5	36x3 1/2	36x5	W	Service, 71	3 1/2	\$4285	4 1/2 x 5 1/2	36x5	36x5 1/2	W
Kelly-S, K-50	5	4900	4 1/2 x 6 1/2	36x6	40x6 1/2	C	Ogden, E	2 1/2	3250	4 1/2 x 5 1/2	36x4	36x7	W	Service, 76	3 1/2	4485	4 1/2 x 6	36x5	36x5 1/2	W
Keystone, 40	2	2450	3 1/2 x 5 1/2	34x5 1/2	38x7 1/2	C	Old Hickory, W	1	2175	3 1/2 x 5	36x3 1/2	36x4	W	Service, 101	5	5275	4 1/2 x 6	36x6	40x6 1/2	W
Kimball, AB	2	2675	4 x 6	36x4	36x7	W	Old Reliable, A	1 1/2	2350	4 x 5	34x4	36x6	W	Signal, NF	1	2475	4 1/2 x 5	34x5 1/2	36x6 1/2	W
Kimball, AC	2 1/2	3975	4 1/2 x 6	36x4	36x8	W	Old Reliable, B	1 1/2	2350	4 1/2 x 6	34x4	36x4 1/2	W	Signal, H	1 1/2	2925	4 1/2 x 5 1/2	34x4	36x6	W
Kimball, AK	3	4500	4 1/2 x 6	36x4	36x10	W	Old Reliable, C	3 1/2	4250	4 1/2 x 6	36x5	36x5 1/2	W	Signal, J	3 1/2	3275	4 1/2 x 5 1/2	36x5	40x5 1/2	W
Kimball, AE	4	5000	4 1/2 x 6	36x5	40x12	W	Old Reliable, D	5	5250	4 1/2 x 6	36x6	40x6 1/2	C	Signal, M	3 1/2	4275	4 1/2 x 6	36x6	40x6 1/2	W
Kimball, AF	5	5975	5 x 6	36x6	40x7 1/2	W	Oldsmobile, KLM	7	6000	4 1/2 x 6 1/2	36x6	40x7 1/2	C	Signal, R	5	5300	4 1/2 x 6	36x6	40x6 1/2	W
Kissel, Express	1	1985 1/2	3 1/2 x 5 1/2	34x5 1/2	34x5 1/2	W	Oldsmobile Econ.	1	1500	3 1/2 x 5 1/2	35x5 1/2	35x5 1/2	I	Southern, 10	1	2390	3 1/2 x 5	34x3 1/2	34x4	W
Kissel, Utility	1 1/2	2775	3 1/2 x 5 1/2	36x5 1/2	36x5	W	Olympic, A	2 1/2	3500	4 1/2 x 5 1/2	36x4	36x7	W	Southern, 15	1 1/2	2590	3 1/2 x 5 1/2	36x6 1/2	34x4	W
Kissel, Freight	2 1/2	3475	4 1/2 x 5 1/2	36x4	36x7	W	Oneida, A-9	1 1/2	2350	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Southern, 20	2	2990	4 1/2 x 5 1/2	36x6 1/2	40x8	W
Kissel, H. D.	4	4475	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Oneida, B-9	1 1/2	2915	4 x 5 1/2	36x4	36x7	W	Standard, 1-K	1-1 1/2	1950	3 1/2 x 5	34x3 1/2	34x5	W
Kleiber, AA	1	2600	4 1/2 x 5 1/2	34x3 1/2	34x5	W	Oneida, C-9	2 1/2	3390	4 x 5 1/2	36x4	36x7	W	Standard, 76	2 1/2-3	3100	4 1/2 x 5 1/2	36x4	36x7	W
Kleiber, AB	1 1/2	3100	4 1/2 x 5 1/2	36x3 1/2	36x6	W	Oneida, D-9	3 1/2	4345	4 1/2 x 5 1/2	36x5	36x10	W	Standard, 66	3 1/2-4	4000	4 1/2 x 5 1/2	36x5	36x10	W
Kleiber, BB	2	3600	4 1/2 x 5 1/2	36x4	36x7	W	Oneida, E-9	5	5460	4 1/2 x 5 1/2	36x6	40x12	W	Standard, 5-K	5-6	5250	4 1/2 x 6	36x6	40x12	W
Kleiber, B	2 1/2	4200	4 1/2 x 5 1/2	36x5	36x8	W	Orleans, A	1 1/2	2750	4 1/2 x 5 1/2	36x3 1/2	36x5	W	Sterling, 1 1/2	1 1/2	3200	4 x 5 1/2	36x3 1/2	36x5	W
Kleiber, C	3 1/2	4900	4 1/2 x 5 1/2	36x5	36x8 1/2	W	Orleans, B	2 1/2	3250	4 1/2 x 5 1/2	36x4	36x7	W	Sterling, 2	2	3500	4 x 5 1/2	36x4	36x6	W
Kleiber, D	5	5600	5 x 6 1/2	36x6	40x12	W	Orleans, C	3 1/2	3750	4 1/2 x 5 1/2	36x4 1/2	36x8	W	Sterling, 2 1/2	2 1/2	3650	4 1/2 x 5 1/2	36x4	36x4 1/2	W
Koehler, D	1 1/2	2100	3 1/2 x 5 1/2	34x5 1/2	34x5	W	Orleans, D	5	4250	4 1/2 x 5 1/2	36x6	40x8	W	Sterling, 3 1/2	3 1/2	4650	4 1/2 x 5 1/2	36x5	40x5 1/2	W
Koehler, M	2 1/2	2700	4 x 5 1/2	36x4	36x7	W	Oshkosh, A	2	3750	3 1/2 x 5	36x6 1/2	36x6 1/2	W	Sterling, 3-W	5	5500	5 x 6 1/2	36x6	40x6 1/2	W
Koehler, MCS	2 1/2	2700	4 x 5 1/2	36x4	36x7	W	Oshkosh, AA	2	3850	3 1/2 x 5	36x6 1/2	36x6 1/2	W	Sterling, 5-C	5	6000	5 x 6 1/2	36x6	40x6 1/2	C
Koehler, F	3 1/2	3300	4 1/2 x 5 1/2	36x5	36x10	W	Oshkosh, BB	2 1/2	4300	4 x 5 1/2	38x7 1/2	38x7 1/2	W	Sterling, 7 1/2	7 1/2	6500	5 x 6 1/2	36x6	40x7 1/2	C
Koehler, MT, Trac	5	5500	4 x 5 1/2	36x4	36x7	W	Packard, EC	2 1/2	3500	4 1/2 x 5 1/2	36x4	36x7	W	Stewart, 11	1 1/2	1350	3 1/2 x 4 1/2	32x4 1/2	32x4 1/2	I
L.M.C., 2-20	2 1/2	2540	4 1/2 x 5 1/2	36x4	36x4 1/2	I	Packard, ED	2 1/2	4100	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Stewart, 15	1	1875	3 1/2 x 5	35x5 1/2	35x5 1/2	I
Lange, B	2 1/2	3350	4 1/2 x 5 1/2	36x4	36x6	C	Packard, EF	2 1/2	4500	5 x 6 1/2	36x6 1/2	40x6 1/2	W	Stewart, 9	1 1/2	2200	3 1/2 x 5	34x3 1/2	34x5	I
Larrabee, U	1 1/2	2400	3 1/2 x 5	34x3 1/2	34x5	W	Packard, EX	2 1/2	4000	4 1/2 x 5 1/2	36x6 1/2	40x8 1/2	W	Stewart, 7-X	2 1/2	2950	4 1/2 x 5 1/2	34x4	34x7	I
Larrabee, SK	2 1/2	3200	4 1/2 x 5 1/2	36x5	36x7	W	Paige, 52-19	1 1/2	2880	4 x 5 1/2	34x3 1/2	34x6	W	Stewart, 10	3 1/2	3850	4 1/2 x 5 1/2	36x5	36x5 1/2	I
Larrabee, FL	3 1/2	4000	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Paige, 54-20	2 1/2	3400	4 1/2 x 5 1/2	34x4	34x4 1/2	W	Stewart, 10-X	3 1/2	3850	4 1/2 x 5 1/2	36x5	36x5 1/2	I
Larrabee, FW	5	4900	4 1/2 x 6	36x6	40x6 1/2	W	Paige, 51-18	3 1/2	4285	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Stoughton, A	1 1/2	1995	3 1/2 x 5 1/2	36x3 1/2	36x5	W
Lion, L	1	2350	3 1/2 x 5 1/2	35x5 1/2	35x5 1/2	W	Parker, F20	2	3500	4 x 6	34x4	36x4 1/2	W	Stoughton, B	1 1/2	2350	3 1/2 x 5 1/2	36x3 1/2	36x5	W
Lueninghaus, C	1 1/2	2100	3 1/2 x 5 1/2	34x5 1/2	34x5 1/2	W	Parker, J20	3 1/2	4400	4 1/2 x 6	36x5	40x5 1/2	W	Stoughton, D	2	2800	4 x 5 1/2	36x4	36x7	W
Lueninghaus, W	1 1/2	2700	3 1/2 x 5 1/2	34x5 1/2	34x5 1/2	W	Parker, M20	5	5500	4 1/2 x 6	36x6	40x6 1/2	W	Stoughton F	3	3600	4 1/2 x 5 1/2	36x5 1/2	36x5 1/2	W
Maccari, L	1 1/2	3150	4 1/2 x 5 1/2	36x4	36x7	W	Patriot, Revere	1 1/2	1795	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Sullivan, E	2 1/2	3350	4 1/2 x 5 1/2	36x4	36x7	W
Maccari, H-2	1 1/2	2925	4 1/2 x 5 1/2	36x4	36x6	W	Patriot, Lincoln	1 1/2	2490	4 x 5 1/2	34x3 1/2	34x5	W	Sullivan, H	3 1/2	4650	4 1/2 x 6	36x5	36x5 1/2	W
Maccari, M-2	3 1/2	3750	4 1/2 x 5 1/2	36x5	36x4 1/2	W	Patriot, Washg'tn	2 1/2	3450	4 1/2 x 5 1/2	36x5	36x7	W	Superior, D	1	1650	3 1/2 x 5	34x4 1/2	34x4	I
Maccari, G	5	4500	4 1/2 x 6	36x5	36x5 1/2	W	Piedmont, 4-30	1 1/2	1885	3 1/2 x 5	34x4 1/2	34x4 1/2	W	Superior, E	2	2600	4 1/2 x 5 1/2	36x4	36x6	I
Maccari, M	5	5500	4 1/2 x 6	36x5	40x6 1/2	W	Pierce-Arrow	2	3750	4 x 5 1/2	36x4	36x4 1/2	W	Super Truck, 50	2 1/2	3300	4 x 6	36x4	36x8	W
MacDonald, A	7 1/2	5750	4 1/2 x 6	40x7	40x14	I	Pierce-Arrow	3 1/2	4950	4 1/2 x 6 1/2	36x5	36x5 1/2	W	Super Truck, 70	3 1/2	4300	4 1/2 x 6	36x5	40x5 1/2	W
Mack, AB D.R.	1 1/2	3450	4 x 5	36x4	36x3 1/2	I	Pierce-Arrow	5	5700	4 1/2 x 6 1/2	36x5	40x6 1/2	W	Super Truck, 100	5	5300	4 1/2 x 6	36x5	40x12	W
Mack, AB	2 1/2	3400	4 x 5	36x4	36x4 1/2	C	Pioneer, 59	1	1550	3 1/2 x 4 1/2	32x4 1/2	32x4 1/2	W	Super Truck 150	7 1/2	6300	5 x 6	36x6	40x7 1/2	W
Mack, AB Chain	1 1/2	3000	4 x 5	36x4	36x3 1/2	I	Pittsburgher, B 21	2 1/2	3800	4 1/2 x 6 1/2	36x5	36x7	W	Texas, A38	1 1/2	1095	3 1/2 x 5	33x4	33x4	I
Mack, AB D.R.	2	3300	4 x 5	36x4	36x4 1/2	C	Pony	2 1/2	400	2 1/2 x 4	28x3 1/2	28x3 1/2	C	Texas, TK 39	1 1/2	1550	3 1/2 x 5	36x6	36x7	W
Mack, AC Chain	2	3750	4 x 5	36x4	36x4 1/2	D	Power, F	1 1/2	400	2 1/2 x 4	28x3 1/2	28x3 1/2	C	Tiffin, GW	1 1/2	2695	4 1/2 x 5 1/2	36x3 1/2	36x5	W
Mack, AC Chain	3 1/2	4950	5 x 6	36x5	40x6 1/2	C	Power, C	3 1/2	4000	4 1/2 x 5 1/2	36x5	40x10	W	Tiffin, MW	2 1/2	3580	4 1/2 x 5 1/2	36x4	36x3 1/2	W
Mack, AC Chain	5	5500	5 x 6	36x6	40x6 1/2	C	Premcar, B-143	1 1/2	2475	3 1/2 x 5	36x6 1/2	36x6 1/2	W	Tiffin, PW	3 1/2	4760	4 1/2 x 5 1/2	36x5	40x5 1/2	W
Mack, AC Chain	6 1/2	5750	5 x 6	36x6	40x12	C	Rainier, R-11	1 1/2	2150	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Tiffin, F50	5	5850	4 1/2 x 6	36x6	40x6	

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive
Ward-LaF., 5A	5	\$5500	5 x 6 1/2	36x6 36x6d	W	Wichita, O	3 1/2	\$4000	4 1/2 x 6	36x5 36x5d	W	Winther, 430	1 1/2	\$2850	3 1/2 x 5	32x4 32x4	I
Watson, E	1	1865	3 1/2 x 5 1/2	34x4 34x4 1/2	W	Wichita, S	5	5000	4 1/2 x 6	36x6 40x6d	W	Winther, 39	1 1/2	2450	3 1/2 x 5	34x3 34x5	I
Watson, N	3 1/2	1250	4 1/2 x 5 1/2	36x5 36x5d	W	Wilcox, AA	1	2100	3 1/2 x 5 1/2	36x4 36x4	W	Winther, 49	2	3250	4 x 5	34x4 34x5	I
Western, W1 1/2	1 1/2	2550	4 1/2 x 5 1/2	36x3 36x5	W	Wilcox, B	1 1/2	2775	4 1/2 x 5	36x4 36x5	W	Winther, 70	3 1/2	4200	4 x 6	36x5 36x5d	I
Western, W2 1/2	2 1/2	3250	4 1/2 x 5 1/2	36x4 36x5	W	Wilcox, D	2 1/2	3300	4 1/2 x 5	36x4 36x5d	W	Winther, 450	4	3690	4 x 6	34x5 36x6	I
Western, W3 1/2	3 1/2	4250	4 1/2 x 5 1/2	36x4 36x7	W	Wilcox, E	3 1/2	4250	4 1/2 x 6	36x5 36x5d	W	Winther, 109	5	5250	4 x 6	36x6 40x5d	I
White, 15	2	2400	3 1/2 x 5 1/2	34x5 34x5 1/2	B	Wilcox, F	5	5200	4 1/2 x 6 1/2	36x5 40x6d	W	Winther, 140	7	5900	5 x 6	36x6 40x7d	I
White, 20	2	3250	3 1/2 x 5 1/2	36x4 36x7	D	Wilson, EA	1 1/2	2270	3 1/2 x 5	36x3 36x5	W	Wisconsin B	1	1950	4 x 5 1/2	34x5 34x5 1/2	W
White, 40	3 1/2	4200	3 1/2 x 5 1/2	36x5 40x5d	D	Wilson, G	2 1/2	2825	4 1/2 x 5 1/2	36x4 36x7	W	Wisconsin C	1 1/2	2250	4 1/2 x 5 1/2	34x5 36x7	W
White, 45	5	4500	4 1/2 x 5 1/2	36x6 40x6d	D	Wilson, H	3 1/2	3685	4 1/2 x 5 1/2	36x5 36x5d	W	Wisconsin D	2 1/2	3500	4 1/2 x 5 1/2	36x6 36x10	W
White Hick., E	1	2450	3 1/2 x 5	34x5 34x5 1/2	W	Winther, 751	5	4520	4 1/2 x 6	36x6 40x6d	W	Wisconsin E	3 1/2	4000	5 x 6 1/2	36x8 36x12 1/2	W
White Hick., H	1 1/2	2750	3 1/2 x 5	36x5 36x5	W			1795	3 1/2 x 5	34x4 35x5 1/2	W	Witt-Will, N	1 1/2	2750	4 1/2 x 5 1/2	36x3 36x5	W
White Hick., K	2 1/2	3350	4 1/2 x 5 1/2	36x4 36x5	W							Witt-Will, P	2 1/2	3250	4 1/2 x 5 1/2	36x3 36x7	W
Wichita, L	1	2300	3 1/2 x 5 1/2	36x3 36x4	W							Wolverine, J	1	2125	3 1/2 x 5	34x5 34x4	I
Wichita, M	1 1/2	2600	3 1/2 x 5 1/2	36x3 36x5	W							Wolverine, J	1 1/2	2375	3 1/2 x 5	34x5 34x5	I
Wichita, R	2 1/2	3000	3 1/2 x 5 1/2	36x4 36x7	W							Wolverine, J	2	2640	3 1/2 x 5	34x4 34x7	I
Wichita, RX	2 1/2	3600	4 1/2 x 6	36x4 36x8	W							Wolverine, J	2 1/2	4100	4 1/2 x 5 1/2	36x5 36x10	I

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.
Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. All others solid. ‡—Price includes body. —Price includes several items of equipment.

Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
All-In One	16-30	\$1975	3	Clim.	4-5 x 6 1/2	GDK	3-4	Gray... 1920	18-36	\$2000	3	Wauk	4-4 1/2 x 6 1/2	Gas.	4	Port Huron... A	12-25	\$1700	4	Chief	4-4 1/2 x 6	G,K	3
Allis-Chalm. B	6-12	925	2	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Ground Hog	19-31	2000	4	Erd.	4-4 x 6	GerK	3	Post... D	12-20	1800	4	Wauk	4-4 1/2 x 5 1/2	GorK	2
Allis-Chal. G.P	6-12	850	2	LeR.	4-3 1/2 x 4 1/2	Gas.	1-2	Gt. Western St	20-30	1950	4	Beav.	4-4 1/2 x 6	K.	4	Prairie Dog... L	9-18	650	3	Wauk	4-3 1/2 x 5 1/2	Gas.	2
Allis-Chalm. H	12-20	1495	2	Mid.W	4-4 1/2 x 5 1/2	Gas.	2-3									Prairie Dog... D	15-30	1250	4	Wauk	4-4 1/2 x 6 1/2	Gas.	3
Allis-Chalm. I	18-30	2150	4	Own	4-4 1/2 x 6 1/2	GorK	3-4	Hart-Parr... 20	20	995	4	Own	2-5 1/2 x 6 1/2	K.D	3	Ranger Cul.	8-16		4	LeR.	4-3 1/2 x 4 1/2	Gas.	1
Allis-Chalm. J	10-18	875	4	Own	4-4 1/2 x 6 1/2	G.K	4	Hart-Parr... 30	30	1595	4	Own	2-6 1/2 x 7	K.D	3	T-20	8-16		4	Dom	4-4 1/2 x 6	K.	3-4
Allwork... 2-G	14-28	1875	4	Own	4-4 1/2 x 6	GorK	3	Heider... D	9-16	1170	4	Wauk	4-4 1/2 x 5 1/2	G,K	2	Reed...	15-30	2250	4	Dom	4-4 1/2 x 6	K.	4
Allwork... C	14-28	1675	4	Own	4-5 x 6	GorK	3	Heider... C	12-20	1395	4	Wauk	4-4 1/2 x 6 1/2	G,K	3	Reed... A-I	18-36	2400	4	Dom	4-5 x 6	Gas.	4
Andrews-Kin.D	18-36	2500	4	Clim.	4-5 x 6 1/2	GorK	4	Heider... Cult	6-10	1050	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Reliable...	10-20	985	4	Own	2-6 x 7	Ker.	3
Appleton...	12-20	1500	4	Buda	4-4 1/2 x 5 1/2	G,K	2-3	Hicks...	20-30		4	...	4-4 1/2 x 6	GorK	3	Rex...	12-25	1600	4	Wauk	4-4 1/2 x 5 1/2	GorK	3
Are... 1921	3-5	550	4	Own	1-4 1/2 x 5	Gas.	1	Huber Light 4	12-25	1185	4	Wauk	4-4 1/2 x 5 1/2	GorK	3	Russell...	12-24	1500	4	Own	4-4 1/2 x 5 1/2	GorK	2-3
Aultman-T...	15-30	2200	4	Clim.	4-5 x 6 1/2	G,K	4	Huber Super 4	15-30	1885	4	Midw.	4-4 1/2 x 6	Gas.	3	Russell...	15-30	2200	4	Own	4-5 x 6 1/2	GorK	3-4
Aultman-T...	22-45	3850	4	Own	4-5 1/2 x 6	G,K	6									Russell...	20-35	3000	4	Own	4-5 1/2 x 6	GorK	4-5
Aultman-T...	30-60	5000	4	Own	4-7 x 9	G,K,D	8	Illinois Super	18-36	2500	4	Clim.	4-5 x 6 1/2	G,K	4	Samson... M	...	995	4	Nov.	4-4 x 5 1/2	G,K	2
Automot. B-3	12-24	1785	4	Herec.	4-4 x 5 1/2	Gas.	2-3	Imperial... C	40-70	5000	4	Own	4-7 1/2 x 9	G,K,D	10	Sandusky... J	10-20	1250	4	Own	4-4 1/2 x 5 1/2	G,K,D	2
Avery, SR, Cul	5-10		4	Own	4-3 x 4	G,K	2	Imperial... F	5-10		2	LeR.	4-3 1/2 x 4 1/2	Gas.	1-2	Sandusky... E	15-35	1750	4	Own	4-5 x 6 1/2	G,K,D	4
Avery... Cult-C	5-10		3	Own	4-3 x 4	G,K	2	International...	8-16	900	4	Own	4-4 1/2 x 5	G,K,D	2	Shawnee Com.	6-12		2	LeR.	4-3 1/2 x 4 1/2	Gas.	10
Avery... B	5-10		4	Own	4-3 x 4	G,K	2	International...	15-30	1750	4	Own	5-1/2 x 8	G,K,D	4	Shawnee Com.	9-18		2	Gray	4-3 1/2 x 5	...	...
Avery... C	8-16		4	Own	2-5 1/2 x 6	G,K,D	2-3	J-T... N	20-40	3485	2	Chief	4-4 1/2 x 6	G,K,D	3-4	Shelby... D	15-30		4	Beav.	4-4 1/2 x 6	G,K	3
Avery...	12-20		4	Own	4-4 1/2 x 6	G,K,D	2-3	Klumb... F	16-32	1650	4	Clim.	4-5 x 6 1/2	...	4	Shelby... C	10-20		4	Erd.	4-4 x 6	GorK	2-3
Avery...	12-25		4	Own	2-6 1/2 x 7	G,K,D	3-4	Knudsen, 1920	25-45	2500	4	Own	4-5 x 9	Gas.	4-6	Short Turn...	20-40	1500	3	Beav.	4-4 1/2 x 6	G,K	3
Avery...	14-28		4	Own	4-4 1/2 x 6	G,K,D	4-5									Square T... A	18-35	2075	3	Clim.	4-5 x 6 1/2	G,K	3
Avery...	18-36		4	Own	4-4 1/2 x 6	G,K,D	4-5	LaCrosse... M	6-12	900	4	Own	2-4 x 6	G,K	1	Steady Pull...	12-24	1485	4	Own	4-4 x 5	Gas.	3
Avery...	25-50		4	Own	4-6 1/2 x 7	G,H,D	5-6	LaCrosse... G	12-24	1250	4	Own	2-6 x 7	GorK	3	Stinson... 4E	18-36	1835	4	Beav.	4-4 1/2 x 6	G,K	4
Avery...	45-65		4	Own	4-7 1/2 x 8	G,K,D	8-10	Lauson...	12-25	1495	4	Midw.	4-4 1/2 x 5 1/2	Gas.	3-4	Stone...	20-40	2250	4	Beav.	4-4 1/2 x 6	G,K	4
Bates...	15-25		4	Own	4-4 1/2 x 6	Ker.	3	Lauson...	15-25	1685	4	Beav.	4-4 1/2 x 6	GorK	3-4	Toga... 3	15-27	2625	4	Wisc.	4-4 1/2 x 6	Gas.	3-4
Bates Mule, H	15-25		4	Midw	4-4 1/2 x 5 1/2	Gas.	3	Lauson... 21	15-30	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Titan...	20-40	900	4	Own	2-6 1/2 x 7	G,K,D	3
Bates Mule, F	18-25		2	Midw	4-4 1/2 x 5 1/2	Gas.	3	Leader... B	12-18	1095	4	Own	2-6 x 6 1/2	G,K,D	2-3	Toga... 3	15-27	2625	4	Wisc.	4-4 1/2 x 6	Gas.	3-4
Bates Mule, G	25-35		2	Midw	4-4 1/2 x 6	Gas.	com.	Leader... N	16-32	1985	4	Clim.	4-5 x 6 1/2	G,K	3-4	Topp... B	30-45	3500	4	Wauk	4-4 1/2 x 6 1/2	Gas.	3-4
Bean...	8-16		1	Own	4-3 1/2 x 4	G,K	2-3	Leader... GU	18-35	2775	2	Clim.	4-5 x 6 1/2	G,K	3-4	Toro Cultivator	6-10		3	LeR.	4-3 1/2 x 4 1/2	Gas.	2
Beeman... G	2-4	315	4	Own	1-3 1/2 x 4 1/2	Gas.	1 1/2	Leonard... E	20-30	2530	4	Buda	4-4 1/2 x 6	G,K	3	Townsend...	10-20	1200	2	Own	4-6 1/2 x 7	Ker	2-3
Best...	30		2	Own	4-4 1/2 x 6 1/2	G,K,D	4	Liberty...	18-32	2475	4	Clim.	4-5 x 6 1/2	G,K	4	Townsend...	15-30	1800	2	Own	4-7 x 8	Ker	3-4
Best...	60		2	Own	4-6 1/2 x 7	G,K,D	8-9	Linn... H4J	40	4500	...	Clim.	4-4 1/2 x 5 1/2	Gas.	4	Townsend...	25-50	3000	2	Own	4-8 1/2 x 10	Ker	4-5
Boring... 1921	18-36	1850	3	Wauk	4-4 1/2 x 6	GorK	3	Linn... W	60	5100	...	Wauk	4-5 x 6 1/2	Gas.	6	Tractor Motor	40-50		4	Own	4-8 1/2 x 10	Gas.	4-5
Burn-Oil, 1921	15-30	1650	4	Own	2-6 1/2 x 7	Ker.	3-4	Little Giant... B	16-22	2200	4	Own	4-4 1/2 x 5	K.	4	Traylor... TB	6-12	715	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1
Capital...	15-30	1000	2	Own	4-4 1/2 x 6	Gas.	3	Little Giant... A	20-35	3300	4	Own	4-5 1/2 x 6	K.	6	Triumph... H	18-36	2450	2	Erd.	4-4 1/2 x 6	Ker.	1
Case...	10-18	1090	4	Own	4-3 1/2 x 6	GorK	2	Lombard...	55-150	...	2	Own	6-5 1/2 x 6 1/2	Gas.	16	Trundar... 10	25-40	3750	2	Wauk	4-5 x 6 1/2	GorK	4
Case...	15-27	1680	4	Own	4-4 1/2 x 6	GorK	3	Lombard...	50		2	Own	4-4 1/2 x 6 1/2	...	6-10	Turner...	14-25	1295	4	Buda	4-4 1/2 x 5 1/2	G,K	3
Case...	22-40	3100	4	Own	4-5 1/2 x 6 1/2	GorK	4-5	Magnet... B	14-28	1875	4	Wauk	4-4 1/2 x 6 1/2	K&G	3	Twin City...	12-20		4	Own	4-4 1/2 x 6	G,K	3
Caterpillar T11	25		2	Own	4-4 1/2 x 6	Gas.	4	Master Jr...	5-10	585	...	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Twin City...	20-35		4	Own	4-5 1/2 x 6 1/2	G,K	5
Caterpillar T16	40		2	Own	4-6 1/2 x 7	Gas.	6	Merry Gar 1921	2	230	2	Evin	1-2 1/2 x 2 1/2	Gas.	1	Twin City...	40-65		4	Own	4-7 1/2 x 9	G,K	8
Centaur...	5-2 1/2	455	2	NWay	2-4 1/2 x 4 1/2	G or K	1-9	Minne... All-P	12-25	1230	4	Own	4-4 1/2 x 7	GorK	3	Uncle Sam C20	12-20	1385	4	Weid.	4-4 x		
Chase...	12-25	200	3	Buda	4-4 1/2 x 5 1/2	GorK	2-3	Minne. Gen.P	17-30	1850	4	Own	4-4 1/2 x 7	GorK	3-4	Uncle Sam B19	20-30	2300	4	Beav.	4-4 1/2 x 6	GorK	3-4
Chicago... 40	40	2500	4	Own	4-4 1/2 x 6	Gas.	4	Minne...							Uncle Sam D21	20-30	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	
Cletrac... W	12-20	1195	2	Own	4-4 x 5 1/2	G,K,D	2-3	Med.Duty	22-44	3300	4	Own	4-6 x 7	GorK	5-6	Universal...	1-4	475	2	Own	1-3 1/2 x 5	G	1
Dakota... 4	15-27	1750	3	Dom.	4-4 1/2 x 6	Gas.	3	Minne...						Utiliter... 501	2 1/2-4	380	4	Own	1-3 1/2 x 4 1/2	G	5-6		
Dart... B.J.	15-30	2100	4	Buda	4-4 1/2 x 6	Gas.	3-4	HeavyDuty	35-70	4600	4	Own	4-7 1/2 x 9	GorK	8-9	Wallis... K	15-25	1600	4	Own	4-4 1/2 x 5 1/2	G,K	3
Depue... A	20-30	2300	4	Buda	4-4 1/2 x 6	Gas.	4	Mohawk 1921	8-16	785	4	Light	4-3 1/2 x 4 1/2	KorG.	1-2	Waterloo... N	12-25		4	Own	2-6 1/2 x 7	G,K	3
Dill... D	20	2180	4	Cont.	4-4 1/2 x 5 1/2	Gas.	3	Moline Univ D	9-18	900	2	Own	4-3 1/2 x 5	Gas.	2	Webfoot... 53	28-53	5250	2	Wisc.	4-5 1/2 x 7	G,D	6
D... R.W.	20	2983	4	Midw.	4-4 1/2 x 6	Gas.	3	Moline Orch.	9-18	1075	2	Own	4-3 1/2 x 5	Gas.	2-3	Wellington... B	12-22	900	4	Erd.	4-4 x 6	Ker.	2-3
Do-It-All...	-7	595	...	Own	1-4 1/2 x 5	Gas.	...	Motor Mault.	1 1/2	195	2	Own	1-2 1/2 x 3 1/2	Gas.	2	Wellington... F	16-30	1400	4	Chief	4-4 1/2 x 6	Ker.	3-4
								Motor...	15-30	2250	4	Buda	4-4 1/2 x 6	Gas.	3-4	Western, 1920	16-32	2100	4	Clim.	4-5 1/2 x 6	Gas.	4
Eagle... F	12-22	1390	4	Own	2-7 x 8	GorK	3-4								Westmor...	12-25	1650	4	Wauk	4-4 x 5 1/2	G,K	3	
Eagle... F	16-30	1850	4	Own	2-8 x 8	GorK	4-5								Wharton... E	12-18	1100	3	Buda	4-4 1/2 x 5 1/2	Gas.	2	
E-B... AA	12-20	1445	4	Own	4-4 1/2 x 5	GorK	3	NB...	3-6	425	4	Own	2-3 1/2 x 4	Gas.	3 1/2	Whitney... 12	9-18	1175	4	Own	2-5 1/2 x 6 1/2	Gas.	2
E-B... Q	12-20	925	4	Own	4-4 1/2 x 5	GorK	3	Nichols-Shep.	20-42	3100	4	Own	2-2 1/2 x 4	Jas.	3 1/2	Wichita... T	15-30	2500	4	Beav.	4-4 1/2 x 6	G,K,D	3-4
E-B...	16-32	2000	4	Own	4-5 1/2 x 7	GorK	4	Nichols-Shep.	25-50	3460	4	Own	9 x 12	GorK	4-7	Wisconsin... E	16-30	2250	4	Clim.	4-5 1/2 x 6	Ker.	5
Evans...	18-30	2000	4	Buda	4-4 1/2 x 6	G,K	3	Nichols-Shep.	25-50	3460	4	Own	9 x 12	GorK	4-7	Wisconsin... H	22-40	3200	4	Clim.	4-5 1/2 x 7	Ker.	5
								Nilson Jr... E	15-25	1775	4	Wauk	4-4 1/2 x 5 1/2	G,K	4	Yuba... 15-25	15-25	2945	2	Wisc.	4-5 1/2 x 6	G,K,D	...
								Nilson Senior	20-40	2475	5	Wauk	4-5 x 6 1/2	G,K	4	Zella... 25-40	25-40	4892	2	Wisc.	4-5 1/2 x 7	G,K,D	...
Fageol... D	9-12	1525	4	Lyce.	4-3 1/2 x 5	Gas.	2	Oil Pull... K	12-20	1485	4	Own	2-6 x 8	K,D	3								
Farm Horse, B	18-30	1885	4	Clim.	4-5 x 6 1/2	G,K	3-4	Oil Pull... H	16-30														

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Denver	Motor Car Festival	Aug. 10 to 13
Toronto, Canada	National Motor Show	Aug. 27
Toronto, Canada	Canadian National Exposition	Aug. 29—Opens
Indianapolis	Automobile and Accessory Show	Sept. 6-10
Cincinnati	Fall Automobile Show	Oct. 1-8
Olympia, England	Automobile Show	Nov. 3-12
Chicago	Automotive Equipment Show	Nov. 14-19
New York	Automobile Salon	Nov. 27-Dec. 3
Chicago	Automobile Salon	January, 1922
New York	National Automobile Show	Jan. 7-13, 1922
Chicago	National Automobile Show	Jan. 28-Feb. 3, 1922
Minneapolis	Tractor Show	Jan. 30 to Feb. 4, inclusive
Winnipeg, Canada	Canada Automotive Equipment Ass'n Show	Feb. 6-11

RACES

Cotati, Calif.	Opening of New Speedway	August 14
Pikes Peak	Hill Climb	September 5
Uniontown Speedway	Annual Autumn Classic	September 5
Los Angeles	Speedway Race	November 24

FOREIGN SHOWS

Buenos Aires, Argentina	Passenger Cars and Equipment	September
Luxemburg	Luxemburg Agricultural Sample Exhibition	September
Paris, France	Paris Motor Show	October 5-16
London	British Motor Show, Society Motor Mfgs. and Traders	Nov. 4-12

CONVENTIONS

Chicago	Twenty-eighth Annual Convention National Implement & Vehicle Association	Oct. 12-24
Cleveland	National Tire Dealers' Association	November
Chicago	Chicago Semi-Annual Convention of Factory Service Managers N. A. C. C.	Nov. 22-24
New York	Service Managers Convention	Nov. 22-24

Business Notes

The Oliver Mfg. Co., Milwaukee, has changed its corporate title to Oliver-Barth Jack Co., to better express the nature of its principal business, which is the manufacture of lifting jacks for the motor car trade.

Oilgear Co., Milwaukee, manufacturing transmission devices and similar specialties for the automotive industries, has recently increased its authorized capitalization from \$150,000 to \$300,000 of preferred stock and 25,000 shares of common stock having no par value.

Atterbury Motor Truck Co., Milwaukee, a \$200,000 concern, has been incorporated in Wisconsin to distribute and deal in Atterbury motor trucks. The incorporators are Paul Hartung and Richard A. Bluem, partners in the firm of Bluem & Hartung, who have been Atterbury distributors for several years.

Biggam Trailer Co. is a new Milwaukee corporation which has been organized with a capital stock of \$250,000 preferred plus 1,500 shares of common stock without par value, to engage in the manufacture and sale of trailers and trailer trucks designed by H. F. Biggam, a pioneer engineer in the automotive field.

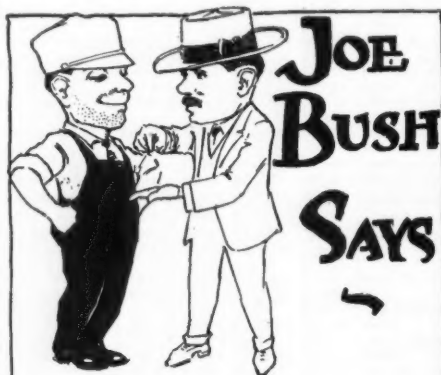
Temme Spring Corp., Chicago, has recently signed a contract with American Autoparts Co., Detroit, under which the entire output of replacement springs of the Detroit plant will be handled by the Temme corporation. This in no way affects the regular production of springs sold direct to car manufacturers, which will be handled solely by American Autoparts Co. as before.

Murphy Motor Co., Nashville, announces the taking over by them of the Reo line. The consolidation caused the company to obtain new quarters, and the former Reo home now houses the Reo.

Philadelphia-Roamer Co. hereafter will handle the Roamer car for eastern Pennsylvania, southern New Jersey, Delaware and eastern Maryland. The organization is not a factory branch, but is closely affiliated with the factory, because A. C. Barley, president and principal owner of the Barley Motor Car Co., manufacturer of Roamer cars, is president and one of the principal owners of the Philadelphia organization.

Accessories Market Grows Brighter in Indianapolis

Indianapolis, July 29—Dealers in automobile accessories here appear to be more optimistic concerning business for July and for the remainder of the year than the motor car dealers. Dealers in motor cars who also handle accessories admit that the accessory business has been fair, but show a pessimistic turn in



JUST because he's a cross-country tourist, don't slight a job on his car.

discussing car sales. In accessories for smaller cars, such as the Dodge and the Ford, the shock absorbers head the list. Dealers say that the demand for bumpers, special wheels, spotlights and locks has been very good—better, in fact, than was expected.

Latest bank reports show business in the banks to have increased materially during the past six months of 1921 and savings accounts to have shown more than their proportionate share of increased business. In spite of this fact, Indianapolis banks are more cautious than usual in lending money. Automobile finance organizations, which finance the purchaser on a payment plan, appear to have plenty of money at the present time and report that since June 15 much better credit conditions have prevailed. Many accounts which have been past due for weeks have been paid up, and payments now are being made regularly. The percentage of non-payment is less than it was this time a year ago.

TO TEST NEW ROTARIAN

Hoboken, N. J., July 29—The first Rotarian car to be manufactured by the Bournonville Rotary Valve Motor Car Co. will be given a transcontinental test run under the supervision of the American Automobile Assn. The engine, which has the Bournonville rotary valve, is the feature of this car and, during the test, the valve mechanism will be sealed. The valve will be calipered before and after the run to show that the wear is negligible.

With the exception of the engine, the new car is assembled of standard parts. The important units are as follows: Columbia axles front and rear, Borg & Beck clutch, Brown Lipe gearset, Arvac propeller shaft and Parish & Bingham frame. The body work and equipment will be of the highest class, and it is anticipated that the complete car will sell for approximately \$5,000. It is believed that these cars will serve to introduce and popularize this type of engine. Later it is intended to license the manufacture of this type of engine.

GOODYEAR ORGANS CHANGE EDITORS

Akron, July 29—Under the new financing control of the Goodyear Co., changes have been made in the publication of the company's various trade journals, while the Tire News, a Goodyear dealers' monthly paper which last year was recognized as one of the largest trade journals in America, has been revived. The publication had a circulation of nearly 100,000 when temporarily suspended last spring.

Under the new arrangement the Tire News is transferred to R. C. McDaniel, former associate editor of the Triangle, the Goodyear salesman's organ. Harold King, of the sales education department, takes over the Triangle, and E. E. Eddy, Triangle editor, becomes associated with the office of L. C. Rockhill, sales manager. C. T. Crudgington, Tire News editor, is transferred to the sales department, and has been assigned to Council Bluffs, Ia., under the Chicago district.